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Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Eighteenth Annual Meeting, Western Gas Association.

OFFICE OF WESTERN GAS ASSOCIATION,
NEW ALBANY, IND., April 17, 1895.

To the Members of the Western Gas Association: The 18th Annual Meeting of the Western Gas Association will be held at Pittsburgh, May 15th, 16th and 17th, 1895, and will be called to order by the President, Mr. I. C. Baxter, at 10 A.M., Wednesday, May 15th.

The Monongahela House has been selected as the headquarters for the members, and the meeting of the Association will be held in a suitable room contained therein. A rate of $3 per day has been obtained for those attending the meeting.

The Executive Committee met at Pittsburgh, last February, and selected the following papers to be presented to the Association:

"Metal Tanks for Gasholders," by Mr. Alten S. Miller, Long Island City, N. Y.

"The Advantage of the Metric System for All Calculations," by Mr. Geo. H. Harper, Altoona, Pa.

"Acetylene," by Mr. F. L. Slocum, Pittsburgh, Pa.

"Recuperative Furnaces, as Applied to Bench Firing: Their Operation and Results," by Mr. J. A. Faux, Pittsburgh, Pa.

"Some Experience with Foul Gas in Holder," by Mr. Jas. T. Lynn, Detroit, Mich.

"Ammoniacal Liquor, with Special Reference to the Universal Saving of Same," by Gas Companies," by Mr. Geo. Osius, Detroit, Mich.

"Natural Gas as a Pioneer for Artificial Fuel Gas," by Mr. Donald McDonald, Louisville, Ky.

"Handling and Storage of Oil by Gas Companies," by Mr. D. J. Collins, Chicago, Ills.

"Best Method of Introducing Gas Engines," by Mr. C. B. Case, Milwaukee, Mich.

"Incandescent Gas Lighting," by Mr. S. M. Highlands, Clinton, Ia.

"Wrinkle Department," edited by Mr. Geo. T. Thompson, St. Louis, Mo.

The Central Traffic Association, Trunk Line, Boston Passenger Committee and Southern Passenger Association have granted rates of 1½ fare for the round trip, conditional on 100 certificates being presented to the Secretary for indorsement. The territory of the Central Traffic Association is bounded on the east by Pittsburgh, Salamanca, Buffalo and Toronto; on the north by the line of, and including points on the Grand Trunk Railway from, Toronto to Port Huron; thence via Lakes Huron and Michigan, to the north line of Cook county, Ills.; on the west by the west line of Cook county and the Illinois and Mississippi rivers to Cairo, including Burlington, Keokuk, Quincy, Hannibal and St. Louis; and on the south by the Ohio river, but including points on either side of that river.

The Trunk Line territory is as follows: From Niagara Falls, Buffalo and Salamanca, N. Y., Pittsburgh, Pa., Bellaire, O., Wheeling, Parkersburg and Charleston, W. Va., and points east thereof, except in New England. The names of the roads making the reduction are as follows: Addison & Pennsylvania; Allegheny Valley; Baltimore & Ohio; Baltimore & Potomac; Buffalo, Rochester & Pittsburgh; Camden & At-

lantic; Central, of New Jersey; Chesapeake & Ohio; Cumberland Valley; Delaware & Hudson Canal Co.; Delaware, Lackawanna & Western; Elmira, Cortland & Northern; Fall Brook Coal Co.; Fonda, Johnstown & Gloversville; Lehigh Valley; New York Central & Hudson River—Harlem division excepted; New York, Lake Erie & Western; New York, Ontario & Western; New York, Philadelphia & Norfolk; New York, Susquehanna & Western; Northern Central; Pennsylvania; Philadelphia & Erie; Philadelphia & Reading; Philadelphia, Wilmington & Baltimore; Rome, Watertown & Ogdensburg; Western New York & Pennsylvania; West Jersey; West Shore; Wilmington & Northern.

The Boston Passenger Committee territory is from points on the following roads: Boston & Albany; Boston & Maine; Central Vermont; Concord & Montreal; Fitchburg; Maine Central; New York & New England; New York, New Haven & Hartford; Portland & Rochester.

The Southern Passenger Association is composed of the following Companies: Alabama Great Southern; Alabama Midland; Atlantic Coast Line; Atlantic & Florida; Atlantic & West Point; Charleston & Savannah; Central Railroad, of Georgia; Cincinnati, New Orleans & Texas Pacific; East Tennessee, Virginia & Georgia; Georgia Railroad; Georgia Pacific; Georgia Southern & Florida; Jacksonville, St. Augustine & Indian River; Knoxville, Cumberland Gap & Louisville; Louisville & Nashville; Marietta & North Georgia; Memphis & Charleston; Morristown & Cumberland Gap; Nashville, Chattanooga & St. Louis; Pennsylvania; Port Royal & Augusta; Richmond, Fredericksburg & Potomac; Savannah, Florida & Western; South Carolina; Southern Railway Company; Western & Atlantic.

All persons attending the meeting will purchase a first class ticket at starting point, paying full fare for same, obtaining from agent a certificate stating that the person whose signature appears on same has purchased at full tariff fare one first-class ticket to Pittsburgh, which certificate, after it has been signed by the Secretary of the Western Gas Association, and a representative of the above Passenger Associations, who will be in attendance at our meeting, will entitle the holder thereof to one-third fare returning home.

All persons availing themselves of the reduced rates will apply to agent 30 minutes before the departure of train. Tickets in accordance with above arrangement can be purchased on and after Saturday, May 11th, and are good, for return trip, on or before Tuesday, May 21st. All agents do not have a supply of certificates, but they may be obtained by request, if notification is made in time. Those parties outside the territory embraced by above four Passenger Associations can obtain reduced rates of 1½ fare for the round trip by purchasing tickets to nearest point within above territory, and from there purchasing a ticket to Pittsburgh No refund of fare can be expected because of failure of the parties to obtain certificates.

There will be an exhibit of gas appliances, to which all manufacturers are invited to contribute. Any information, as to space and place of exhibit, can be obtained from Mr. F. L. Slocum, President of the Gas Engineering Company, of Pittsburgh. It is important that exhibitors apply for space at once and complete their arrangements.

This year we meet in new territory, adjacent to which are many Companies whose officials are not members of the Western Gas Association. We hope that many will embrace this opportunity to become members. The Secretary will be pleased to give those desiring to become members any information wanted, and to mail them copies of the Constitution and By-laws.

The Question Box is now ready to receive inquiries, and those obtained before the meeting will be published, so that all may come prepared to answer them. The Secretary will be pleased to have a number of questions sent him. A cordial invitation is extended to members of other Associations to attend our meeting, and it is hoped that many will avail themselves of the opportunity to be present.

JAS. W. DUNBAR, Secretary.

BRIEFLY TOLD.

THE PITTSBURGH MEETING OF THE WESTERN ASSOCIATION.—All the advance arrangements for the Pittsburgh meeting of the Western Gas Association have been completed, and it now remains for the members to see to it that the energy displayed by the executive management has not been in vain. None, however, know better than we that the members can be relied upon to complete the meeting by their interested attendance; for in the past no others have, in their hearty and united support of the Association to which they pay particular allegiance, outstrided the members of the Western Association in their well-paced march to the post that marks the advance line of the great industry, the best interests of which we all are anxious to uphold. President Baxter and Secretary Dunbar, as the chief executive officers of the Association, have had a rather more difficult time of it than the gentlemen who preceded them in these offices for some years back; for other presidents have had the sense of security which came from the knowledge that behind them was a secretary who had the skill born of tact and nurtured by training, and in such knowledge were undisturbed by any thought which taught of failure. Not so with Mr. Baxter, since his term was coeval with that of Mr. Littleton's successor; and there was the element of uncertainty. The sequel so far shows that the Association knew its man when Mr. Dunbar was named for Mr. Littleton's place, because everything has followed in proper order, nor has anything been neglected. A glance at the Secretary's official notices shows what we may expect from a visit to Pennsylvania's "Metal City" in mid-May. The paper list is simply great, no less than 10 numbers on set subjects being promised by writers who are qualified well to expound their themes. It will be noticed that the range of topics is notable for its diversity, nor does one of them seem to savor of the advertising order, unless it be that Mr. McDonald's contribution may take on something of that kind. A fair reference to him is that he has heretofore made the best of his opportunities for exploiting the intrinsic merits of the particular fuel gas system favored by him in Kentucky's chief city; and an equally fair inference is that he has best succeeded in convincing himself. Editor Thompson's "Wrinkle Department" cannot be other than interesting; and here we come to finish up with that which we ought to have named at the beginning—Mr. Baxter's address and the findings of the special committee to report upon the policy of "Federation." Mr. Baxter has always been a positive man, and of the nature positive that does not admit of swerving, even when self-interest would point the way towards bending the knee so that an easy seat would be his portion to-morrow—or the day after. Wherefore we may look for something from him that will have the ring of belief in it. Possibly the members would like to have his views on the weight of the load that the financiers who reorganized the Detroit Gas Company have placed upon its engineering staff; but as tact is very different from time-serving, we imagine Mr. Baxter will not attempt to be "more Catholic than the Pope." So far as we can judge, from fugitive opinions delivered in our hearing respecting the Western's attitude towards Federation, the project will receive scant support at Pittsburgh. One difficulty looms up in connection with the comfort of the members, so far as housing is concerned, and the trouble lies in the fact that another convention is to be held in Pittsburgh during the time of the Western's meeting, and this convention will also claim the Monongahela House as headquarters. There are several other good hotels in the city—notably the Duquesne—and a hint to the wise is sufficient, the hint in this case meaning, "secure your quarters well in advance."

THE ORGANIZATION MEETING OF THE PROPOSED LIGHTING ASSOCIATION FOR TEXAS.—Too late to give full publication to its text, we received a circular, from Mr. W. E. Holmes, of the Austin (Tex.) Gas Light and Coal Company, Provisional Secretary of the proposed lighting Association for Texas, announcing that the organization meeting has been called to take place in Houston, Tex., at 10 A.M. of May 22d. The meeting is to be held in Masons' Hall, corner of Main street and Rusk avenue, and, as the circular says, "The meeting will be a strictly business affair—no banquets, excursions or 'blow-outs' of any description; but we all expect to have a thoroughly enjoyable time, nevertheless." We always thought that Texans were as much up to having a "good time" as New Yorkers, for instance; and it is quite likely that that will come later. The call is signed by 18, whose names are well known in the gas and electric lighting industry of the Lone Star State, and we make no doubt that a permanent and valuable organization will result from the Houston assemblage.

NOTES.—Ex-Mayor Matthews, of Boston, is wondering where he is at just now, for at a shareholders' meeting, held on the evening of the 25th inst., the following Directors were elected to manage the affairs of the Boston Gas Light Company: J. Edward Addicks, Wilder M. Bush, Nathaniel J. Rust, Chas. A. Vaille, C. R. Todd, Samuel Little, W. E. L. Dillaway, F. P. Addicks, Walter R. Addicks and Samuel Thomas—the latter takes the place of the Hon. Nathan Matthews, Jr. The Board then perfected the following organization: President, J. Edward Addicks; Treasurer, F. P. Addicks; Clerk, C. R. Todd. The Directors elected for the Bay State Gas Company are: Samuel Little, F. P. Addicks, W. E. L. Dillaway, J. Edward Addicks, Wilder M. Bush, Walter R. Addicks, C. R. Todd, M. M. Cunniff and Samuel Thomas. Talk about your lightning changes!——The funeral services over the late Mr. A. P. Collins, of New Britain, Conn., an account of whose life will be found in our current item columns, were celebrated on the 24th inst., the Rev. Dr. Cooper officiating. The honorary pall bearers were D. N. Camp, W. H. Hart, H. E. Russell, C. S. Landers, Jas. H. Eddy and A. J. Sloper.

[Concluded from page 569.]

Municipal Ownership of Public Corporations.

[By Mr. M. J. Francisco, in *Engineering Magazine*.]

The New York *Sun*, in an editorial upon the subject, says: "Why may it [the State] not proceed to take and run the railroads and express companies, to work the mines, and then go on to the management of all manufactures, and finally to the control and monopoly of all business, to the entire destruction of private enterprise? Then everybody who worked would be in the government employ, prices would be regulated by government, individual enterprise would be gone, and with it would go the liberty for which mankind has ceaselessly struggled through so many centuries. The Roman empire made about the same experiment in the fourth century, with the consequence that, not only the empire, but also society itself, went utterly to pieces."

The experience of the most sagacious men in the nation shows that municipal ownership is not conducive to the best interest of any city. Professor Ashley, of Harvard University, who was at Toronto at the time the changes were made in municipal management there, says: "I am thoroughly in favor of private management. I came to this opinion after four years' experience of Toronto city government, starting originally with a very strong leaning toward municipal management."

It is only necessary to give the experience of cities which have tried the experiment to show the worthlessness of the claim that municipalities can produce light at less expense than private corporations. As an illustration of this, I will refer to Wheeling, West Virginia, which recently installed a plant of 400 arc lights to burn all night, using steam power, coal costing $1 per ton. Before this municipal plant was established, the local Company offered to furnish any number of lights that might be desired, to burn every night and all night, for $72.52 per lamp per year. Parties in Wheeling who had political aspirations made the claim that a plant could be installed for $26,000. This was afterwards raised to $40,000, and again to $60,000, while the actual cost proved to be $125,000. The advocates of municipal ownership represented to the taxpayers that the total cost of running 400 arc lights, if the city owned the plant, would not exceed $14,000 per year, being $35 per lamp. They adopted the plan, and bonded for $80,000 at 6 per cent. interest, besides using $22,233 of the gas works' funds (owned by the city) in installing the plant. The principal was payable at the rate of $8,000 per year. Six dynamos were installed with five circuits, one dynamo to be kept as a spare machine. Soon after starting, the armatures began to burn out; lamps were taken off in the hope of relieving the dynamos, thereby stopping the heavy loss; but this did not answer the purpose. In 1894 it became necessary to buy another dynamo and cut down the number of lamps on each circuit, making six instead of five. The City Clerk, on page 4, reports the cost of maintaining lights for one year at $30,142.42. This does not include interest, depreciation, taxes, insurance or water rent. During 1893 the funds of the Gas Trustees were exhausted; a coal bill amounting to $15,659.15 could not be paid, as the city authorities had been allowed to use $22,233 of the funds in constructing the electric light plant. In view of the city's heavy indebtedness, and the fact that its finances were so low that it could not pay the interest or the $8,000 of principal on bonds which were due, the bondholders agreed to extend the payment of interest and bonds another year. The fallacy of the claim made by the advocates of municipal ownership that the entire cost of running the plant for a year would not exceed $14,000 is shown by the actual experience for a year, during which time the payroll alone amounted to $17,191. The taxpayers have learned the truth regarding municipal ownership, and there is trouble; the constant refrain now heard is the "electric elephant on their hands." This is one illustration of the results produced by adopting the unreliable reports and figures used by the advocates of municipal ownership. Experience is a very good teacher, but sometimes rather expensive; and, when the authorities found that it was costing them $112.73 per lamp per year for the same light that the local company offered to furnish for $72.52, they no doubt would have cheerfully dumped the parties whose advice they had followed into one of their huge political machines to see if it would increase the number of amperes required and decrease the steady loss.

Statements have been scattered broadcast by the advocates of municipal ownership that the entire cost of light at Little Rock was only $51 per lamp per year. Many cities and committees have based their calculations upon this statement, and voted to adopt municipal ownership because the expense, as shown by reports from Little Rock, was so much less. Upon investigation, it appeared that two reports were made by the authorities of Little Rock, one of which gave a glowing account of the electrical business. The other seems to have been made for the information of the Aldermen only. On page 17 of this second report, the City Clerk says: "In compliance with your request, I have made a comparative statement of the expenses of this department. The statement made by the City Clerk in January must be corrected, notwithstanding the report has gone out that this city has been running its lights for $51 per lamp per year. The expenses for this year are $8,043.84, which equals $80.43 per lamp per year." This report was made to the Mayor, and shows that the cost of lights until midnight, on moonlight schedule, not including interest, depreciation, insurance, taxes or water rent, was $80.43 per lamp per year. The City Clerk also plainly states that the previous report, which had been scattered broadcast, was false. The Kansas City committee were informed that the total cost of lights was $47.45 per lamp per year, and the Hamilton committee were given $69.83 as the cost, while the Evansville committee were told that the cost was $70; and the Superintendent states, in his report to the Mayor for the same year, that the cost was $80.43 per light. The statement that was sent the committee of Kansas City, showing that lights only cost $47.45, has been produced by the advocates of municipal ownership before almost every City Council that has called for the cost of lights at Little Rock. The Mayor, in his message (page 5 of city report), says: "The electric plant is composed of old, antiquated machinery." This statement was made by the Mayor only three years after the plant was installed, and thereupon an appropriation of $30,000 was made for repairs and new apparatus, although, as the report shows (page 18), $9,622.70 had already been spent for repairs. Here we have the record of a municipal plant after three years' use, and, if we add the expense of repairs to the $80.43 which the Superintendent says the lights cost, we have a fair illustration of the benefits to be derived by a city attempting to manage a commercial industry.

Judge Cooley well says: "In a large number of cases the anticipated benefit was never received, and, as is likely to be the case where municipal governments take part in projects foreign to the purpose of their creation, it has furnished unusual facilities for fraud and public plunder, and led almost inevitably at last to discontent."

The facts cited above show the practical working of municipal plants. The same analysis could be made of nearly every one in existence, if space permitted, with the same general result.

The political record of this country shows conclusively that the constant changes caused by alternating party triumphs must destroy all interest in governmental enterprises on the part of those in charge of them, who well know that they hold their places only during the term that must elapse between elections. The politician who wins will reward his friends by placing them in charge, regardless of the fact that they have had no experience in the business. In this way the mechanical and other details that must be carefully watched and guarded in order to make the enterprise a success are neglected, and the taxpayers wonder why the mysterious power called electricity eats up so much of the public money. The Council of the city of Philadelphia made a very extensive investigation of the subject of municipal ownership, calling upon the best posted men in the country for their experience, and also securing the testimony of experts, which filled over 140 printed pages. Specifications of the cost of installing a plant were demanded. The director of public safety employed an expert to make specifications, and it was estimated by him that the total cost would be $97,360. The chief of the electrical bureau made specifications, which placed the probable cost at $100,510. Mr. Cowling made specifications, showing a cost of $221,907.50. The committee made specifications, showing a cost of $251,763. Here we have the estimates made by four different parties, all based upon the same number of boilers, engines and dynamos—in fact, every one was for precisely the same capacity of plant—and the difference between the estimate made by the Council committee (some of whose members were practical electric light men) the estimates made by the city director and his expert, who were in favor of municipal ownership, was $154,403. After this, the most thorough and most complete investigation of the cost of electric lighting ever made in this country, the Council voted against municipal ownership.

This shows plainly that, when an honest investigation is made, it will convince any board of aldermen who are acting for the best interest of their city and its taxpayers that it is their duty to oppose municipal ownership.

A college professor without practical experience or knowledge of the business published a text book for use in schools, in which, on page 302, he made the statement that the cost of electric lighting, when a city owned the plant, was 33⅓ per cent. less than when lights were fur-

nished by a private corporation. As an illustration, he cites the city of Rutland, Vt., stating that the private company compelled the city to pay $280 per lamp per year, and upon this basis he shows a saving of 33⅓ per cent. in favor of municipal ownership.

What are the facts in *this* case? The city referred to, in which, according to the professor's statement, the lights cost $280 per lamp per year, has paid during the past five years an average of only $89.40 per lamp per year, burned every night until midnight, and this, too, with the poorest quality of soft coal, costing $4.50 per ton.

As the writer has checked every lighting bill paid by the city during the above time, he knows whereof he speaks. Still, the statement made in this text book, in which the cost of lights per lamp per year is placed at a figure exceeding by $190.60 the price actually paid, has been copied and sent broadcast as an illustration of the benefits of municipal ownership and an argument for its adoption.

The time for municipalities to own and conduct commercial industries has not arrived, and will not arrive until men are born into a world where politicians and aldermen protect taxpayers and refuse "boodle;" when children are removed from parental influence and nurtured by the State, as advocated by Plato; when employees, with no interest in the business except to aid the political bosses and draw their salaries, can conduct the business more economically and successfully than men who have perhaps every dollar of their fortune depending upon its success; when, in fact, the millennium arrives, and the whole human family is transferred to some eternal city lying beyond the misty shore of time. Until that time comes, let all cities confine their business to regulating and governing, leaving commercial industries with their hazards and losses to individuals and private corporations.

The Control of Public Service Corporations.

[By Mr. Allen Ripley Foote, in *Engineering Magazine*.]

"Let all cities confine their business to regulating and governing, leaving commercial industries with their hazards and losses to individuals and private corporations."—M. J. Francisco.

I am asked to prescribe a remedy for existing evils growing out of the relations between municipalities, municipal public service corporations and the users of the services rendered by them. A true settlement must be one that will correctly balance the interests of all these factors, and give to each the advantages it can justly claim.

The first principle to be recognized is that the greater interest must always control the lesser. Upon this principle government by the majority is founded. A public improvement, such as widening a street in a congested portion of a city, may cause many individuals much inconvenience and loss, for which no compensation is provided; but, being a direct advantage to a much larger number of persons and of great general advantage to the municipality as a whole, the few must acquiesce to the convenience of the many, and permit the work of widening the street to be done.

There is but one limit on the rule of the majority. That is, its action must be just. This limitation circumscribes every person, and every group of persons from the smallest combinations to the greatest nations. To establish justice governments are organized. When justice is established, a correct balance will be firmly maintained between the interests of the municipality, of the corporations, and of the users of services, so that the relations between them shall be those of mutual benefit and helpfulness. In the domain of justice it is impossible that any person or group of persons can be permanently benefited by their own acts of injustice. If this were not true, there could be no justice.

It is not good business to secure a temporary advantage at the expense of a permanent advantage. That which is for the moment an advantage may, in the larger view, be seen to be a loss. A burglar may have a temporary enjoyment from his ill-gotten gains, but it is impossible that he should permanently improve his life in such a way. Attempts to secure more or to give less than justice requires are the cause of all the injustice from which mankind suffers. What municipal public service corporations shall give for what they receive; what the users of the services rendered by them shall receive for what they pay; how collective municipal interests shall be benefitted by the collective demand guaranteed to corporations through granting them special privileges—are all questions that cannot be correctly settled, and from the settlement of which no permanent gain can be made, unless they are settled in strict accord with the requirements of ethical and economic justice. A gain of high value will be made when this fact is clear to the perception of every one.

Coming now to practical considerations, it must be apparent to every one that all factors of uncertainty increase the cost of doing business; therefore all acts of commission or omission which result in uncertainty as to the perpetuity of the exclusiveness of the business of a public service corporation must increase its price for the services it renders. The increase of a price for such a reason is an unjust tax on the users of the service, because it is unnecessary. A striking illustration of the cost of uncertainty is furnished by the sale of 62 millions of United States coin bonds to draw 3½ per cent. interest, when the buyers offered to accept *gold* bonds at 3 per cent. interest. Had Congress ordered $16,000,000 of gold taken from the treasury and sunk in the ocean beyond the power of recovery, the economic result for the people would have been the same as now; but the indignation of the people would be overwhelming, because the directness of the plunder and wanton waste would enable them to understand the injustice of the act. As it has been done, the indirectness of the effect and the slowness of its manifestation permit the people to sleep while the blood is quietly sucked out of their economic system.

In the organization and control of municipal public service corporations the chief factors of uncertainty that can be at once eliminated by the repeal of unjust and the enactment of just laws are those regulations limiting the duration of the corporation, limiting the time for which it may make a special use of the highways or privileges where its plant is located, and then adding a guarantee that it shall not be encroached upon by any competing organization. In every department of endeavor the expectation of securing a future good is the energizing power relied upon to stimulate right doing. Justice requires that faithful and efficient service shall be the royal title to the right to perform the service as long as it may be required. Such an assurance is the only condition that will justify a workman in yielding up his life in preparation for and in doing perfect work in any vocation. Such a condition is the only one that will justify public service corporations in providing the best constructions and equipments known to their art—which are safer, more reliable, and less expensive to maintain than those built for a comparatively temporary use. The regulations should require a corporation organized to supply a special need to construct works designed to supply the need as long as it exists.

The chief objection to granting exclusive franchises is found in the belief that competition is necessary to force low prices. But in the domain of governmental economics we have an effective substitute for competition in the right to control charges by means of wisely-devised systems of arbitration. In determining the price a corporation should charge for its services, justice requires an examination of all evidence offered and will permit the cross-examination of every person giving evidence. Its findings will be based upon the ascertained necessary cost of producing the service, plus a fair return for the interest and profit of the capital employed. Such a method will give to a municipality and to the users of the service the full advantage of favorable local conditions of which it may be the fortunate possessor. It will assure the corporation just treatment and relieve it from the expense of lobbying municipal councils or State Legislatures in behalf of a fiat price, which it will naturally endeavor to secure at the highest rate possible. Being assured of a continuous right to supply the service, and of just treatment in the price it may charge, the corporation can enter upon the work of furnishing the best known service at the lowest practical price, with confidence in its immunity from blood-sucking ordinances in city councils or bills in State legislatures. These conditions will relieve it from all unnecessary burdens, such as free service, lobbying expenses, large attorneys' fees, and newspaper protection. Being protected by just laws, it will need no other protection. The fact should be recognized and acted upon that a just price, to be charged by public service corporations, includes justice for the users of the services as well as for investors in such undertakings; and further, that the determination of a just price is a judicial, not a legislative, function.

The volume of service is an important factor in determining cost. Competition is supposed to stimulate demand through reducing prices. There is a limit, however, to the demand for any service within a specified area. It is not possible for two plants to render a service as cheaply as it can be done by one that could control and supply all the demand within the reach of both. The inevitable result of a multiplication of plants is an increased cost resulting in an increased price, or in a loss on the investment. The first is unjust to the users of the service, the last is unjust to investors in the plants. Uncertainty resulting from short-time contracts, limited life of the corporation, and lack of protection in its area of operation is a far more serious source of evils than a superficial observer can be made to understand.

The city of Baltimore furnishes an object lesson for those who suppose that prices can be permanently reduced by the methods of competition. In unintelligent efforts to secure low priced gas, franchises

have been granted to one competing company after another, until six gas plants, more or less complete, have been built in that city. One after another the competing companies have died, until now there is but one company owning all the works, doing business on an investment several times larger than is necessary.

It has been supposed that it was necessary to leave a margin for speculation in drawing regulations controlling such organizations. This is a mistake. Every element of speculation is one of uncertainty. Every factor of uncertainty retards the investment of capital and enhances the cost of obtaining it. Remove all uncertainty, and capital will clamor for the privilege of an investment in the stocks and bonds of public-service corporations, as it did recently for an opportunity to invest in United States bonds, and at no higher rate of interest. Economically considered, investments in the stocks and bonds of productive industries should be as safe as, and more profitable than, investments in political mortgages. The only reasons why they are not so are found in the unintelligent conditions imposed upon, and privileges granted to them by those who legislate for the people. National banks are organized and inspected under a uniform system. Their managers, investors in their stocks, and their depositors are all vitally interested in keeping them in a sound condition. These three classes include the best business men in every community. If experience has taught the necessity for uniform organization and independent auditing in the case of national banks, is it not fair to assume that important gains can be made for municipalities, municipal public-service corporations, and for the users of the services rendered by them, by a uniform system of organization, accounting, independent inspection, and auditing by State authority?

Such a system would make scientific statistical comparisons possible. It would induce competition, not between corporations in the same city, but between cities, to show best results for money expended. The rewards would be growth of cities with a resultant increase in the values of property and volume of business, better service at decreased prices for users, better managed and more surely profitable corporations.

All the evils complained of exist because there is no well-defined public policy, based on correct economic principles, by which legislators are bound to square their actions and upon which managers of corporations can depend for the protection of their business interests. On account of this deficiency, legislation is in a chaotic condition, and government, instead of being honestly and intelligently directed, is guided by prejudices and guessing. This is the cause of the dissatisfaction and antagonism existing between municipalities, corporations and users of services. The self-interest factor in each is not properly adjusted to that of the others. This throws the whole economic mechanism out of order. The result is unnecessary friction, irritation and loss. A remedy for the evils must deal with the broad question of public policy rather than with specific cases, which are simply local symptoms of a universal disease. The energizing force of self-interest pervades municipal, corporate and individual action. Properly to settle the problem, the forces of self-interest actuating the factors must be so balanced that at no point will antagonism be developed, but at every point of contact there will be reciprocal benefits and an augmentation of energy.

The factor of greatest importance is the self-interest of the users of services. From their patronage is drawn the life-blood of the industry. Upon their prosperity depends the prosperity of the corporation, of the municipality, of the State and of the nation. The interests of the users of service is satisfied by having service rendered in the best known manner at the lowest practicable price. This desideratum, I maintain, can only be established through properly organized and regulated public service corporations owning and operating the plants as profit-producing industry. The requirements for proper organization and regulation are:

Uniformity of organization, accounting, independent inspection, and auditing required by the State. In the absence of any general State laws, then the organic municipal charter should be amended to provide for these conditions.

No issue of stocks or bonds should be permitted except for tangible value necessarily employed in the organization, purchase, construction, equipment or operation of the plant.

No charge should be permitted for franchises or privileges of any kind.

No limitation should be placed on the life of the corporation, or upon the time during which it may supply the services it is organized to render.

No taxes should be assessed upon the property, business or income of the corporation.

No competing company should be permitted to divide patronage within the area served by an existing corporation.

Prices charged for services should be adjusted from time to time on the basis of cost of production, plus interest on capitalization, at the rate paid by the municipality on its bonds, and a reasonable profit.

All surplus earnings should be used to retire bonds, without permitting a capitalization of the values represented by them; or, if no bonds, for extending the plant, without capitalizing the investment.

Under these conditions services can be rendered in the best known manner at the lowest practicable prices, and the corporation stocks and bonds will be the best investments in the world, because the self-interests of the corporations, and of the users of the services they render, will be well secured, and the municipality will enjoy the best economic advantages that science and art can devise.

If State and municipal authorities cannot properly regulate and control public service corporations under these conditions, how will they acquire the ability properly to invest taxpayers' money in the construction and operation of municipally owned plants or works? Many people honestly suppose that good services at low prices will result from public ownership. This fallacy has gained ground by appeals to prejudice instead of judgment, and very largely by imperfect and misleading statements of the results of municipal ownership. A brief analysis and comparisons of conditions will show that the expectation of making a permanent gain over private corporate management by means of municipal ownership must inevitably be disappointed.

When a government undertakes a business, its function of regulating and controlling that business is obliterated. The power of regulation can be exercised only by an authority outside of and superior to the corporation to be regulated. State regulation of political corporations is vitiated by the intimate relations between municipal and State politics. There is no compensating gain to cover the loss of the power of regulation.

A municipality has no capital except that which it exacts from private property. The process of obtaining capital in this way is expensive. It is unnecessary, if private capital will take the business and conduct it better than a municipality can, at no greater cost to users. Sound public financiering requires that funds shall not be collected by taxation for a purpose that can be served as well by an investment of private capital under private management. If a municipality borrows money for the purpose of constructing municipal public service works, it must pay interest for its use. Under the conditions I have named private capital will accept the same rate of interest. No gain can be made on this item.

The difference between the cost of public work, even when erected by contract, and the cost of similar work when done for private account is proverbial. No city is without an illustration. The reason for this is easily found. In the case of public construction, public funds are expended by those who have no interest in the investment, and the investment is made without any idea that the plant constructed must earn a commercial profit as a condition governing its continual operation or the employment of the managers and employees engaged in its operation. The self-interest of those engaged in the work of construction is detached from the work in which they are engaged, causing an inevitable indifference to its best economic execution. No gain can be made in cost of construction.

A municipality permits no competition, pays no incorporation or other taxes of any kind, pays nothing for franchises, and has no limit on its corporate existence, or upon the time during which it shall render the services which it undertakes. It is an untaxed, perpetual, exclusive and uncontrolled political monopoly. To make comparisons equitable, these conditions must be granted to private corporations, except that of no control. The loss of proper control occurs when municipalities engage in business. What reason is there to suppose that a municipal government would manage the street car service well, when it cannot well manage the simpler work of street cleaning? If it is less efficient in management, then its management must result in a loss; and this is the result of every case of municipally owned and operated plants for rendering industrial public services, all pretended records to the contrary notwithstanding. The attempt to secure a gain by divorcing the self interest of the worker from the work he is to do is contrary to the instincts and reason of human nature. It is not in accord with ethical or economic law. It cannot be done.

The paramount consideration to the people of every municipality *is the right to control*. If the control be wisely and justly administered, no sort of public ownership, participation in profits, or franchise price can possibly equal the public benefits which are certain to accrue from judicial control.

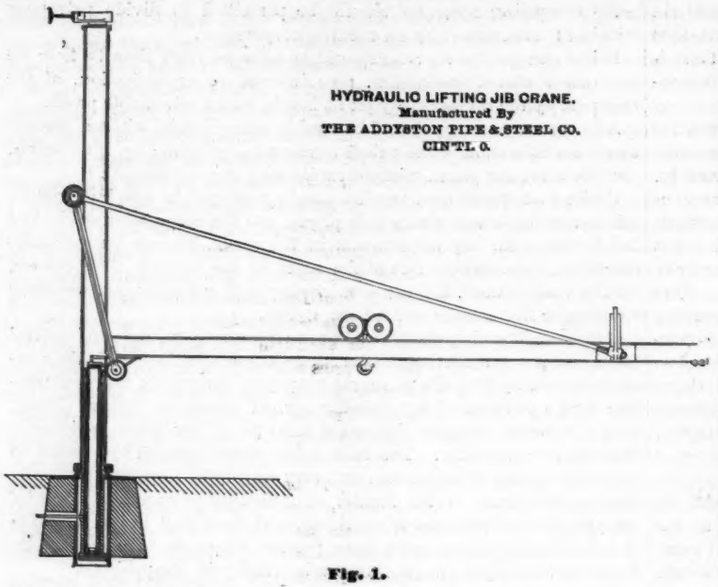

Fig. 1.

Hydraulic Cranes.

The Addyston Pipe and Steel Company, of Cincinnati, Ohio, is putting on the market some specialties in hydraulic cranes, three examples of which are herewith illustrated:

Fig. 1 illustrates a crane of the jib lifting type, designed to lift 6 tons under a working pressure of 400 pounds to the square inch. The mast is made up of two steel "I beams;" the top spindle has roller bearings; bottom spindle rests on steel balls. The jib is also formed by two steel "I beams," supported by two diagonal rods running to two roller bearing flanged wheels on the back of mast. These wheels are connected with wheels at heel of jib by two steel "T bars." These wheels are also roller bearing and flanged. The trolley carriage is mounted upon four wheels (flanged) with roller bearings. The cylinder is located between the two "I beams" forming the mast.

A load of six tons can be easily pushed in or out on the jib, or swung to any position within radius of crane, as friction on bearing parts is diminished to a minimum. Four of this type are in use at the Addyston works and are giving entire satisfaction.

Fig. 2 illustrates a lighter hydraulic crane of the jib lifting type for handling cores in the Addyston pipe shop, and for general light lifting in the foundry and cleaning sheds.

The mast of this crane is also made up of two steel "I beams," and has a roller bearing spindle at the top and ball and roller bearing bottom spindle through which the cylinder gets its supply of water.

The jib is made of one steel "I beam," supported by two diagonal rods running to two wheels on the inside flanges of mast. These wheels are connected with heel of mast by two pieces of steel "T bars." The heel of jib rides on two wheels bearing against mast.

The trolley has two wheels running on roller bearings. This crane is shown on a building post—it can be made to bracket against a wall. Eight of these are in use at the Addyston works, and they also give satisfaction.

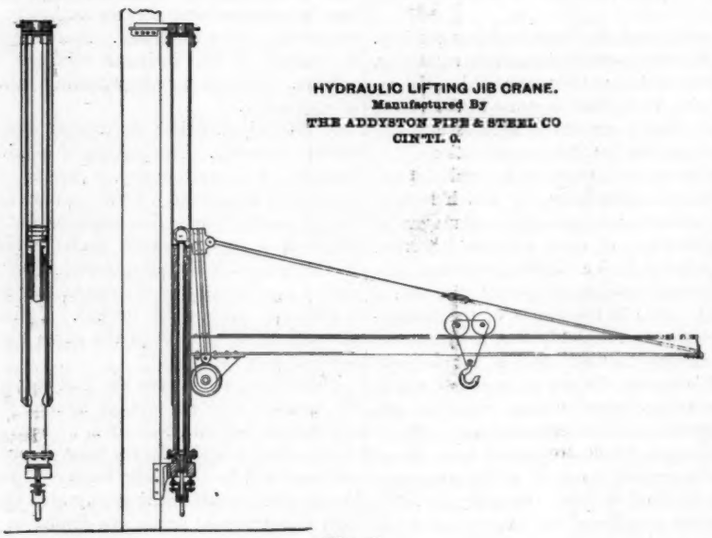

Fig. 2.

Fig. 3 illustrates a small, light crane that can be fitted against a post or a wall. Trolley is fitted with an ordinary chain block, and has two wheels with roller bearing. Jib is made of one "I beam."

In addition, power cranes of any required capacity can be supplied, and the experience which this Company has had with some 30 hydraulic cranes in its own works, many of them of its own design and construction, insures cranes suitable for the requirements.

The Gas Manager in Constantinople.

[By Mr. W. S. McGregor, in the *Gas World*.]

The Imperial Ottoman gas works, Dolma Bagtche, Constantinople, were erected, as far as can be ascertained, some 45 years ago, to supply the imperial palaces and government workshops. The works have been gradually extended, and now the cities of Galata and Pera, and all one side of the Bosphorus, are supplied by them. On the Asiatic side the supply is given by a Company floated by a Belgian syndicate. By 1890 the Dolma Bagtche works, though they had been enlarged from time to time, had become incapable of supplying the quantity of gas required, and it had become evident even to the Turk that something had to be done in order to provide a sufficient supply of gas for the growing wants of the city. In that year the writer was appointed engineer of the works; and this is what he found when he arrived on the spot:

The Original Works.—There were three retort houses. The largest contained 16 settings of 7's, small D's, 14 inches by 14 inches by 7 feet 6 inches long, and the two smaller houses contained, respectively, three settings of 7's and four settings of 3's, or a total of 145 mouthpieces. Carbon had been allowed to accumulate in the retorts to such an extent that in several cases only about 18 inches space was left for carbonizing. The two chimneys for the retort house were built upon the retort bench, and were so choked with dust that the flue covers had been removed to allow the furnace gases to

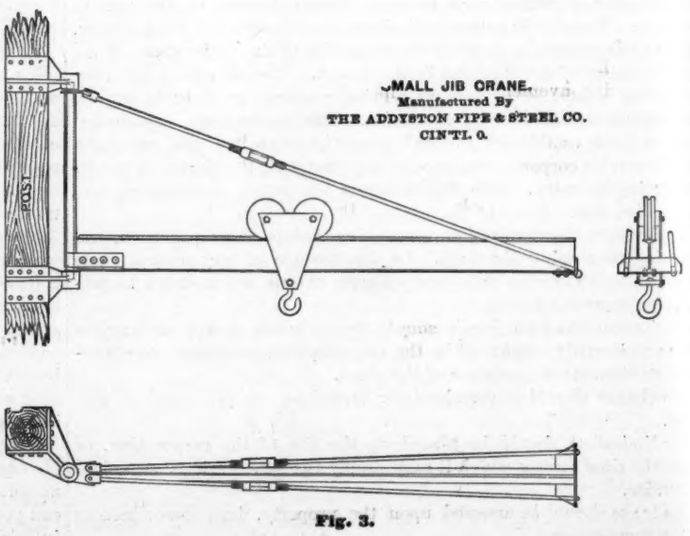

Fig. 3.

make their escape under the roof. The retort house had a wooden roof covered with sheet iron, and occasionally added to our troubles by catching fire. The condensers were fairly good of their kind, consisting of the usual type common in small works, upright pipes, with tar box arrangement at bottom. There were two 10,000 cubic feet per hour exhausters, driven by a gas engine of most erratic disposition, and as these exhausters had been running night and day for over five years without repair, their condition can be more easily imagined than described. Besides, they were driven at about 210 revolutions a minute, and the noise of the slides could be heard a couple of hundred yards away. That they ran so long speaks volumes for the excellent material and workmanship put into them. A washer there certainly was, but as the inside passages for the crude gas were about six times the area of the inlet pipe, the gas was driven through in tremendous gulps. The scrubber was 12 feet high by 6 feet diameter, filled with coke, and acted as an excellent slow condenser and tar extractor. The purifiers, four in number, were 12 feet square and 4 feet deep, arranged to work two on and two off. With two such purifiers at work, and a daily make of 400,000 cubic feet, perhaps the less said about the purity of the gas the better. The station meter was in keeping with the rest of the apparatus, and will not bear description.

A Curious Gasholder.—There were five gasholders, three of them each 30 feet in diameter by 12 feet deep, one 40 feet by 22 feet, and one 73 feet by 16 feet. The three smaller holders were in the last stages of decay, and were guided by an arrangement similar to a curtain ring sliding up and down an iron rod, but at times refusing to go either up or down. The largest holder and tank were of native workmanship, and were decidedly unique. The tank was built close to a large culvert, which drains some of the upper parts of the city, and when originally built was 80 feet in diameter, and the holder 78 feet 6 inches by 20 feet. What actually took place when the holder and tank were finished and set to work is a matter for conjecture, but that the tank leaked badly and the holder was damaged are facts beyond dispute; an examination of the arched roof of the culvert proved that beyond a doubt. However, the ruling spirit of the works had got over the difficulty by building a new tank inside the old one, 6 feet less in diameter, and cutting down the gasholder to suit. The original guide columns were left standing on the old tank. A 3-inch bar of wrought iron (round), 17 feet long, was leaded into the stone coping of the inner tank, the top end of the bar being held by a strut bolted to the top of the original column. The same process was repeated with the next column; then a cast iron girder was bolted on to the guiding bars, and a wrought iron strut placed midway on the girder and bolted to the original girder of the old framing. Counterbalance weights and pulleys, with the chains going over both framings, were then added, and the work was complete; and there it stands, a monument to native engineering.

Turkish Time.—As for governors for controlling pressure, they were considered unnecessary, although some parts of the city are nearly 300 feet above the works, and there are three separate leading mains to supply the different levels. The gas used to be shut off from the city at sunrise, and not turned on again until 9 o'clock, Turkish time, *i. e.*, three hours before sunset. Perhaps it had better be explained that Turkish time is reckoned very differently to European time. In Turkish time 12 o'clock is sunset, whereas in European time 12 o'clock is midday; consequently, Turkish time is continually varying, because, of course, the time of sunset is always changing. This system of keeping time, however satisfactory it may be to the Turks, is attended with great inconvenience; for example, the railway company keep European time, the lines of passenger steamers that ply up and down the Bosphorus, and to the Princes Islands, keep Turkish time, and the suburban railway trains are run on European time; and numerous other examples might be quoted.

After the writer took charge of the gas works 28 additional retorts were put in, to meet the work of the coming winter; as the gas engine was of a very erratic disposition, sometimes refusing duty for days on end, a boiler and steam engine were ordered; also a weighing machine, three station governors, and governor burners for the street lamps. Up to that time there had not been such a thing as a weighing machine about the works. While waiting for the apparatus to arrive we had to face the winter as best we could; and the misery and anxiety of that first winter will not be easily forgotten.

Excavating a Tank.—Owing to the difficulty of obtaining ground for new works, the writer advised that part of the old retort house should be fitted with large-sized retorts and regenerator furnaces, and in the following spring the remaining portion; for the building was of ample size and in good condition excepting the roof. But finally it was decided to erect new works complete, capable of a maximum production of 1,000,000 cubic feet per 24 hours. The work of clearing the ground and preparing the foundations for the new buildings was done entirely by natives; and a strange, mixed lot they looked—Armenians, Circassians, Kurds, Persians and Turks. While excavating the ground for the gasholder tank some curious relics of old-world history came to light, notably the remains of an ancient sarcophagus of white marble, said by experts to date back to the time of the Pharoahs. The lid was in excellent preservation, and the beautiful carving proved the workman of olden times to be quite as expert as his brother of to-day. Coins were also found, but nearly all were copper.

The usual mode of carrying in the East is by means of panniers slung over horses' backs, and this method was adopted for removing the spoil from the tank. About 120 horses, mules and donkeys were engaged in the work, the drivers being mostly Persians. The scene while the work was going on was animated and picturesque, what with the different costumes and the cries and shouts of the donkey drivers, of the *ekmekji*, or bread seller, and of the water, fruit, sherbet sellers; for all these are admitted into the works to cater for the workmen. The authorities refuse to interfere with them; indeed, tacitly encourage them by making purchases.

A portion of the tank foundation proving unsatisfactory, it was decided to pile it, and application was made for a steam pile driver. The pile driver duly arrived, in the shape of eight strong, sturdy *hammalls*, or laborers, carrying their machine, which consisted of part of the trunk of a tree, about 9 inches diameter and 4 feet long, shod at one end with an iron ring, and perforated at the upper end with holes to receive handles, so that the affair looked like a broken wheel. Around this four men grouped themselves, while one the *hammall bashi*, literally head of the *hammalls*, began a sing-song tune, to which the men kept time while driving the piles. The whole affair was primitive in the extreme. Progress was slow, as was to be expected, but the work was done thoroughly, and the tank, when filled, proved perfectly sound, not the slightest settlement or leakage taking place. As to the cost, it would be better not to discuss that question. When the authorities decide, there is no appeal, especially when you are met with the reply, "What are the poor men to do for bread if you use steam machinery?"

During this part of the work measures had to be taken to prevent damage by water, as a very serious accident occurred some months previously, through the works being flooded by one of these rain storms so common in semi-tropical climates. The works being situated at the end of a valley on the shores of the Bosphorus, they are peculiarly liable to accidents of this kind, more especially as the upper districts of the city discharge the storm water into a stream which flows through the valley and under the gasworks on its way to the sea. The storm had lasted about 30 hours, when the culvert became choked with some branches of trees and other debris; the water rose rapidly, burst through the retaining wall in one resistless flood, and poured into the works. One small holder was lifted up above the guide columns, and fell over; a second one was badly damaged; and the main pipes of the low lying parts of the city were flooded, the streets in some parts being two feet under water. It was an experience never to be forgotten.

Gates Guarded.—The system adopted with regard to workmen is widely different from anything at home. When a man is engaged he comes on probation, probably to fill up the place of a man who may be sick or disabled, and during that time he receives no pay, only a double ration of bread. When on the regular staff he receives his pay monthly, and also his rations of bread; a room is provided for sleeping accommodation, and he brings his own bedding. As for bedsteads, they are unknown, the floor serving for all that is required. No workman is allowed to leave the factory without permission, and as all the entrances are guarded with soldiers, this rule is strictly enforced, save for the higher officials. The arrival of the *ekmekji*, or bread man, in the early morning is quite an event. All the pariah dogs of the factory begin barking, and follow the horses carrying the bread, on the chance of getting a crust thrown to them by some of the men. And, to his credit be it said, the Turk is kind to all animals. He has religious scruples about taking life, even refusing to kill such vermin as rats and mice. Why the dogs are tolerated is a mystery, as they are a nuisance. Although they may be, and are, beaten with impunity, to take their lives is punishable with fine and imprisonment. Again, the pigeon is a sacred bird. All the public buildings, factories and mosques are infested with them, and they become so bold that they will scarce hop out of one's way. They build their nests everywhere, the purifying houses especially being a sort of happy hunting ground for them.

The means for transport of materials are of the most primitive description. The coal and lime brought into the works in panniers or

baskets slung on horseback, each basket holding from 1½ to 2 cwts. When 100 tons of coal are required daily it becomes at times difficult to find horses. On one occasion the writer, being placed in a difficulty by the refusal of the contractor to supply extra horses, engaged bullock carts, and the experiment proved a decided success. The difficulty of transporting heavy materials, such as boilers and engines, can hardly be estimated, and it is no sinecure to have charge of native workmen engaged in such work.

Coal in Turkey.—Turkey possesses vast mineral wealth, more especially coal and iron. The best, and nearly the only, coal mines at present being worked are in Asiatic Turkey, on the southern shores of the Black Sea, in the province of Heralia. The writer has had different opportunities of testing and examining the coal found in these provinces and of advising the Government on that subject. Unfortunately, in Turkey, as at home, red tape prevails to a great extent, and private interests are so much mixed up with public affairs that it is nearly im possible to get any radical reformation carried out in a satisfactory manner. There are seams of excellent coal, but the method of working them is so antiquated that a great deal of the material is wasted, and what is delivered is in bad condition mixed with stones and dirt, rendering it useless for any other purpose than steam raising. However, the present Minister of Marine, with the shrewdness and judgment that have characterized his administration in other affairs, has caused surveys to be made, and appointed a qualified mining engineer, so that probably an improvement will be seen before long.

Appended are some analyses of native coal:

General Analysis of Coal from Heralia, all Samples being taken from Bulk and Air-Dried for 24 Hours.

Average loss in weight, 4 per cent.

Average total moisture expelled at 105° C., 1 per cent.

		No. 1.	No. 2.	No. 3.
Volatile matter		43.00	27.60	30.05
Coke.	Fixed carbon	48.35	65.10	55.45
	Ash	8.65	7.30	14.50
		100.00	100.00	100.00
Sulphur in coal		1.97	2.23	2.01

These tests were made principally for steam purposes, and the coal was not in the best condition, being mixed with foreign matters. The proportion of volatile matter in No. 1 sample is comparatively high; but when tested for illuminating power an average result from all the samples gave about 12.73 sperm candles, tested by Sugg's London Argand.

For disposing of the tar made, briquettes are manufactured, and these give fairly good results when tested against the coal, as under:

Volatile matter		30.05
Coke.	Fixed carbon	55.45
	Ash	14.50
		100.00

Unfortunately, the proportion of ash is very high in all the samples.

Excellent limestone is being worked in quarries a few miles from the city, but, as is common with native industries, all the appliances, both for working and burning the limestone, are of the most crude description; and so conservative are the Turks that little progress is being made towards introducing better machinery. The greater portion of the limestone worked is burned in rudely constructed kilns, fired with brushwood. The lime taken from these kilns is excellent for gas purification. Underneath is given the average composition of a number of samples taken from bulk, and tested for gas purification purposes:

Carbonate of lime	81.03
Magnesia	14.23
Iron	0.75
Alumina and clay	2.96
Moisture	1.03
	100.00

Native oxide of iron is also obtained in small quantities, but the proportion of oxide is so small that it would not pay to use. Still, the writer is of opinion that good native oxide can be had, as several isolated samples gave excellent results. But, as a rule, samples are collected in such a haphazard way that it is difficult to arrive at reliable data.

THE new foundry which the Jackson & Woodin Mfg. Company is building at Berwick, Pa., was designed by the Berlin Iron Bridge Company, of East Berlin, Conn.

Preservation of Iron Structures Exposed to Weather.

[Abstract of a paper by MR. E. GERBER, Mem. Am. Soc. C. E., taken from the Society's *Bulletin*.]

Some fears having arisen that iron oxide applied to certain large structures was causing the metal under the paint to rust, from the fact that rust was found under the paint where there was no indication of it on the surface, the writer was instructed some time ago to make an examination of a large number of prominent bridges, all painted with this same oxide of iron paint, and to report on the visible condition of the paint and the condition of the metal under the paint. In the course of this examination the following structures were examined:

The bridges at Cairo, Ills.; Memphis, Tenn.; Merchants, at St. Louis, Mo.; Bellefontaine, near St. Louis; Leavenworth, Kas.; Rulo, Nebraska City, Plattsmouth, U. P. Bridge, Omaha and Blair, Neb.; Sioux City, Ia.; and Alton, Ills.; all painted with one kind of pure iron oxide paint, mixed with pure linseed oil.

The drawbridge at Omaha, Neb.; the lower bridge at Winona, Minn.; the Union passenger station at St. Louis; the State street, Wells street, Clark street, Adams street, Jackson street, Van Buren street, Wisconsin Central bridge at Polk street, in the city of Chicago; all of which were first painted with red lead and subsequently with some other paint, usually oxide of iron.

The wagon bridge at Omaha, the Madison street bridge and Madison street viaduct in Chicago, painted with an unknown paint, but having the appearance of being a white lead, tinted.

The Rush street bridge, Dearborn street bridge and viaduct, Lake street bridge and viaduct, Lake street elevated, Jones & Laughlin's bolt shed, Adams street viaduct, Jackson street viaduct, Metropolitan elevated, Harrison street bridge and viaduct, Polk street draw and viaduct, and Taylor street bridge and viaduct, all of which were first painted with what appeared to be an iron oxide paint.

Visits were also made to the shops of the Missouri Valley Bridge and Iron Works, and Lassig Bridge and Iron Works.

On all structures examined, regardless of what the paint was, rust was found to some extent under the paint. In some cases this was very little, in others much worse, and it was found on all parts of the bridge, whether specially exposed to the weather or not. The rust was in spots in most cases, the limits of the spots being often quickly reached. In most bridges the clean metal predominated. It was found in general that a metal which had come from the rolls with a smooth surface was much less likely to have rust under the paint than one which had left the rolls with a rough surface. Plates were as a rule freer from this rust than shapes or angles, though when the latter were smooth they were clean. Eyebars were usually free from rust, and those portions of members in iron structures which had been heated in process of manufacture showed also less rust than others. The age of the structure did not seem to have any special influence on the rust under the paint, as some of the bridges which had stood longest were much cleaner than others which had been built only a few years.

Of the bridges mentioned in the second paragraph as having been painted with a known oxide of iron, the Blair bridge had been standing the longest, it having been erected in 1883, painted in 1884, and not since. While this bridge showed more rust externally than some of the newer bridges and those which had been repainted, the metal under the paint was remarkably clean. On the other hand, the Bellefontaine bridge, which was erected in 1893, and painted in 1894, had a good deal of rust under the paint.

Some of these same bridges had been given a coat of oil in the shop, while others had been painted there, and it was noticeable that the bridges which had been oiled had much cleaner metal under paint than those which had been painted in the shop. At Alton and Bellefontaine guard angles had been shipped to the bridge without either oil or paint on them. These were thoroughly cleaned in the field before painting, and the iron under the paint on them was perfectly clean when examined.

On a number of the bridges marks were found which were evidently painted on the metal with white lead in the mill; wherever these marks were removed the metal under them was invariably found clean. Other marks of a similar character, which could be traced, however, definitely to the shop, were often found with rust under them.

The nature of the rust spots, which were observed under the paint, was generally of a thin, filmy character, of a yellowish color, and apparently not in an active state; at times heavier rust was found, but this was comparatively rare. The rust spots under the paint on old bridges were no worse than under that on the newer ones, which shows pretty conclusively that the rust under the paint is not active.

As for the condition of the paint itself, that on the bridges mentioned in the second paragraph—namely, the pure iron oxide mixed with pure oil—was tough in every case, and adhered very firmly to the metal, the adhesion and toughness improving with the age of the structure, except in one case where an unusually large quantity of paint had been applied, and this probably frequently. In this case the full thickness of paint was comparatively soft where not exposed to sun, and where it was in this soft condition it was readily removed.

The paint on the bridges painted with red lead, with the exception of that on the drawbridge at Omaha, was universally brittle and very easily removed. The same was true of the mill and shop marks wherever found. On the Winona bridge, which had been painted with white lead as a finishing coat, the paint was cracking wherever exposed to sun.

A few structures painted with carbon paint showed this to be non-cohesive and easily removed.

The paint on the bridges in Chicago, which were painted with iron oxides, other than the one referred to above, was brittle in some cases, and in others tough; it appeared much better, however, than the red lead paint.

As for durability of paint, none of the bridges painted with red lead had stood more than seven years without repainting, and most of them had stood only two or three. When comparisons could be made, however, between bridges of about the same age and same exposure to atmospheric conditions, the comparison seemed to be in favor of the oxide of iron. The Clark street bridge in Chicago, erected in 1889, and not painted since, was quite rusty on the trusses and much worse on the floor system. The Dearborn street viaduct, erected in 1888, and not repainted, is in better condition than the Clark street bridge. The Dearborn street, Polk street, and Taylor street draws, all painted with iron oxide paints, though repainted, show little rust now or signs that many old rust spots have been repainted, and are in better condition than those at Clark and Wells streets, although about 16 years older. The Winona bridge, painted four years ago, is showing signs of rust in many places, and the present indications are that this bridge, painted with red lead, will be much worse at the end of 10 years than the Blair bridge, painted with iron oxide 10 years ago, is now.

At the bridge shops it was noticed that there were rust spots on the iron before the material was manufactured, and this in spite of the fact that the metal was housed from the day of its receipt until finished, as is the case in the shops of the Lassig Bridge and Iron Works. The character of the rust spots developed in the shop corresponds exactly with the rust spots which were found under the paint in the field. A limited amount of cleaning and scraping did not do away with the rust spots entirely, and girders, after being finished and covered with oil, showed very plainly numerous rust spots scattered over the entire surface, and when the oil was scraped from these the identical appearances were observed that were found under the paint on the finished bridges in the field.

From the foregoing observations it is evident that the oxide of iron applied to metal as a paint was not the cause of the rust found under the paint, which was the principal thing to be determined. It is further apparent that the oxide of iron, which has been written and spoken against so much of late years, is at least as good as any other paint which was observed. Where it was known that the paint was composed of pure pigment and pure oil it was invariably found tough and adhering to the metal with great tenacity. It is also without much question durable, as two coats applied to one structure 11 years ago are still in practically perfect condition where the rust from under the paint had not eaten through it, and it has protected thoroughly clean metal and that which was rusted but slightly.

Lead paints, on the other hand, were almost without exception brittle, and as compared with oxide of iron paints of the same age were not in as good condition.

A good paint is one which is readily applied, has good covering powers, adheres well to metal, and is durable. The pigment should be inert to the metal to which it is applied and also to the oil with which it is mixed. All of these qualities are possessed by iron oxide. It is readily mixed and applied, has covering power superior to almost any other pigment, and adhesion and durability are clearly shown in the foregoing observations. It is well known that iron oxide as found in nature is one of the most durable substances, and it has been shown that it has no affinity whatever for oil—in fact this is a feature sometimes used as an argument against it. The lead paints, on the other hand, do not mix well, and hence are difficult to apply. They have an affinity for oil which causes them to set rapidly, making it necessary to apply them before setting, for if not the paint is worthless. Probably on account of the rapid drying these paints are usually brittle and do not adhere well to iron, and they are more readily attacked by the action of the atmosphere and its vapors and gases than some other paints.

More important, however, than the quality of the paint is the condition of the metal before any paint is applied. Under present conditions rust exists on all structural metal as it leaves the shops regardless of where it is manufactured, and it is very seldom cleaned properly before painting, although nominally this is required. To obtain good results from painting absolute cleanness of metal is the first requisite, and this should be accomplished in the bridge shops by some mechanical or chemical means, such as scrapers operated by power, the sand blast, or by pickling. So long as cleaning is done by hand it will not be properly done.

Under present conditions it is desirable to oil metal in bridge shops rather than to paint it, inasmuch as oil is not an opaque covering, and the condition of metal shows for itself and can be improved after erection and before painting if necessary.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, April 10, 1895.

An Explosion in a Purifier.—Gas and Ventilation.—Mr. West on Economical Lighting.—An Infant Gas Consumer.—The Standard Photometer.

A remarkable accident occurred some little time since at a gas works in Scotland. A gang of workmen commenced to remove the contents of a lime purifier, and had operated for some minutes, throwing out about one-fifth of the upper layer of fouled material, when a very mild explosion, or ignition of gas, occurred, which had the effect of severely scorching several of the laborers. An inspector was sent to hold an inquiry, with a view of arriving at the cause of the accident, by the Board of Trade. This gentleman has just issued his report. After plainly and clearly setting out the facts as ascertained from evidence taken on the spot, the inspector—Mr. A. G. Vernon Harcourt—proceeds to trace the causes, and concludes with several excellent suggestions for preventing a repetition of the occurrence. The source of ignition is believed to have been a spark struck from one of the shovels in the act of working by smart contact with a piece of flint accidentally present in the lime, or perhaps with the side of the purifier. This appeared to be the only possible cause, but was open to the objection that gaseous mixtures are not easily ignited by sparks of this kind. The matter was investigated by Mr. Harcourt in a course of special experiments, and he has elicited the important and interesting fact that the presence of sulphur compounds, such as carbon disulphide, in a gaseous mixture, greatly increases the liability to ignition by percussion sparks. This discovery suggests the need for great care in working, where there is a possibility for accumulations of crude or unpurified gas to obtain, and it is desirable that all concerned in the practical work of gas manufacture and purification should be aware of the fact that crude gas fires more readily than the purified article. The size of the vessel in question was 35 feet square, and it was charged with two layers of lime, each 7 inches thick. There was no leakage into the box, all the valves being sound and tight, so the inflammable matter was simply the residual gas confined in the spaces beneath each layer of lime. The inspector suggests that these spaces might be ventilated by taking out one or two grids from each layer at opposite corners, the first thing after raising the lid, before commencing to discharge the material. If this was done, he considers that a period of 15 minutes would be ample for the entire escape of inflammable gas.

An article from the pen of Mr. Thos. Fletcher, published in a recent number of the *Architect*, is a tract for the times. In these days, when so many people hold an interest in crying down gas, one is quite accustomed to meet with all sorts of wild and extravagant statements, ascribing violent poisonous properties to the products of combustion which pass off from gas burners, and it is amusing to observe that apparatus possessing the solid advantages of efficiency and economy in use is attacked most bitterly. The public are allowed to possess a rusty iron burner tip, that does not develop a duty of 2 candles per foot of gas in peace and quietness; but give them an appliance that yields 20 candles, and they are solemnly and energetically warned as to the consequences. All who have to contend with competition of this sort—and, for that matter, those who have not—will do well to follow Mr. Fletcher's clear and careful reasoning from beginning to end, with a view of making it known in the proper quarters. There is nothing upon which the public more easily takes alarm than questions of health. Raise a cry of

"dangerous to health" about something that the majority do not understand, and the said majority prefer to avoid risk at once. Remembering this, there is the more need for contradicting and confuting such erroneous statements. The motive for Mr. Fletcher's plain and instructive communication was afforded by the condemnation of a system of flueless gas heating stoves in a chapel, notwithstanding the fact that it had been in satisfactory operation for four years, on the ground that the air was rendered unfit for respiration by the evolution of thousands of cubic feet of carbonic acid and organic impurities from the gas. Ascertaining the average number of the congregation, the author shows that the average production of carbonic acid by respiration is 480 cubic feet per hour, and the lighting burners when in full operation would evolve 143, while the "thousands of cubic feet," said to come from the heating stoves, showed up, in the light of sober investigation to 61 cubic feet per hour. Organic impurities are given off with the breath from human beings, but are totally absent from the gas burners. Mr. Fletcher remarks that "the moisture given off by the combustion of coal gas is sterile, and does not lend itself to the cultivation of bacteria." The kernel of the whole matter is the fact that, given a supply of fresh air in quantity sufficient, according to recognized authorities, to replace the vitiated air, the use of properly constructed apparatus for lighting or heating by means of gas is of no consequence, so far as any effect on the condition of the air is concerned. The evolution of carbonic acid from each burner is compensated for by the fact that it is also a source of an upward current. Take the case of a person engaged in reading or writing at a table, with a gas light about 2 feet above his head. If the burner and shade are properly made, he will experience no discomfort from radiant heat and get better ventilation than would obtain if an electric light was substituted for the gas. There is a continual current of air away from the worker up through the gas globe to the ceiling, where, if the room is efficiently ventilated, there will be provision for its escape. And its place is supplied by fresh air. The electric light does practically nothing towards maintaining an upward current. This fact can easily be illustrated, to the entire conviction of sceptical friends, by the smoke of a cigar.

An interesting lecture on the economical lighting of public buildings, workshops and other large enclosed spaces, has been delivered at Manchester by Mr. John West, the well known inventor and manufacturer of retort house machinery. The gist of his subject is contained in the details of some practical experiments, showing the cost of incandescent gas lighting, of ordinary flat flame gas burners, and of incandescent electric lamps. A large and lofty workshop was lighted, in the first place, by means of four clusters of flat flame burners, comprising eight No. 5's in each group. Careful experiments showed that the quantity of gas consumed by each cluster was 33½ cubic feet per hour, the cost of which, with gas at 2s., 6d. per 1,000 cubic feet, would be just over one penny.

The light yielded from each group of eight was equivalent to 81½ candles. This arrangement of lighting was replaced by three clusters of incandescent "C" burners, six in each group. Although the consumption was reduced nearly one-half, each cluster of six using only 18½ cubic feet per hour, the lighting value was 350 candles. Practically the result of introducing the incandescent was four times the light at half the cost. But against this must be credited the first cost, each cluster of the incandescents being four times as costly as the flat flames, and there is also the cost of maintenance. With reasonable care this need not be a large item, so there is a very large margin in favor of the incandescent burner. Further on in the lecture the cost of the above installation is compared with that of incandescent electric lighting at 6d. per unit, to the great disadvantage of the latter. The gaslights yield more than three times the light at less than one fourth the cost. It is interesting to observe that the ordinary flat flames show a large saving as compared with the electric light.

I think it is Artemus Ward who gives an amusing account of his experiences as a census agent, and amongst other things of the difficulties encountered in arriving at the correct age of certain ladies. Yet this delicate question is one that will have to be considered by the Corporation of Manchester if the ingenious plea adopted by a lady gas consumer in that city is copied to any extent. The lady kept a tobacconist's shop and was supplied with gas in the usual way. When pressed to pay, however, she disclaimed liability on the ground that she was under legal age, and, therefore, not liable for anything beyond necessaries, and that gas was not a necessity. She produced a certificate of birth, according to which her age would be 18. So far, her claim was correct for anyone under the age of 21 is regarded in the eye of the law as an infant unable to incur debt. This is one of those curious cases in which, the law persists in closing its eyes to plain fact. But, unfortunately, the infant tobacconist was not prepared with evidence of identity. Possibly, her appearance was against her, but, however that may be, she was ordered to pay her gas bill. It seems, however, as if the Corporation only secured their dues by a fluke, which illustrates the glorious uncertainty of the law. So that, perhaps, the rental clerks will find their duties increased by the onerous condition of ascertaining the correct age of ladies who wish to use the gas. In that case, woe to the unlucky young man who forgets to ask an elderly female, obviously well over 50, whether she is of legal age.

The veracity of the indications furnished by the standard photometer has been called in question lately on several occasions, and been the object of proceedings in the law courts; and from the numerous points raised, not only in connection with the actual operations at the photometer, but also in connection with preparation of reports and other subsequent proceedings. The much abused "sperm candle" of course comes in for a share of abuse. But it is evident that if our best authorities agreed on a satisfactory substitute for the candle to-morrow (which, by the way, is a very remote prospect) very little would be done in the way of placing the examination of illuminating gas on a fair and satisfactory basis. The Gas Company at Littlehampton have lately been brought before the magistrates on a charge of supplying gas that did not conform to the legal standard of illuminating power. The offence was considered proved, and they were fined. They appealed against this decision on the grounds that the report and test on which the conviction was based did not comply with the terms of the Act. The consumption of gas was not adjusted to 5 cubic feet per hour, and the candles were not burning for 10 minutes before each testing. But, although these assertions were not disputed, they did not gain their appeal. The Liverpool authorities have arrived at a friendly understanding with the Gas Company as to the use of a portable photometer in addition to the existing testing stations. If the results of any testing with this apparatus are below the standard, the Gas Company undertake to do their best to ascertain the cause and provide a remedy. The Liverpool people are to be congratulated on their good sense. This is an improvement on the plan of begging the question by legal quibbling. In London, the Commercial Gas Company have successfully contended a case with the chief gas examiner. This gentleman furnished a report to the effect that tests showing that the gas at one of the testing stations was below the prescribed quality on two specified occasions were valid. The plea advanced by the Gas Company was that the candles used did not comply with the terms of the Act, and also that the chief examiner had taken evidence without giving them notice. The report was pronounced illegal on these grounds.

Smoke Prevention in Germany.

Engineering remarks that some years ago the Prussian Government inquired of the Central Verband der Preussischen Dampfkessel Uberachungs Vereine whether, in their opinion, the time had arrived for legislating on smoke prevention and for fixing definite regulations concerning grates, flues, etc. The union replied in the negative, but expressed their readiness once more to enter upon experimental research, in which they trusted the Government would assist them with funds. Some delay occurred, as the various bodies consulted had different suggestions to offer, and as the committee appointed could not agree upon a programme. In February, 1893, the tests were commenced by Messrs. Schneider, Caspar and Tschorn, all three of Berlin. A research fund of $2,500 had been placed at their disposal, to which fund the Government had contributed $750, the city of Berlin $1,000, the above mentioned union of associations for the superintendence of steam boilers $250. The report on the work, which appeared in April, 1894, was prefaced by a notification that objections had been raised against the publication of this report, as it was not in itself considered complete, owing to the fact that further investigations were contemplated, and these, we believe, are still going on. Moreover, it was felt that the inventors of the respective appliances experimented upon might make an undesirable use of the publication. In the *Zeitschrift des Vereins Deutscher Ingenieure*, Mr. R. Stribeck, of Dresden, however, gives a critical digest of this report. In his opinion, the objections were well founded, and he does not think that the report, although a great deal of work had been done, and although curves were plentiful, would contribute very much to the solution of the problems involved. Tests were made of the grates of Messrs. Kowitzke, Chubb, Stauss, Kuhne, Schomburg (these two are of the Tenbrink type), Ruthel, Donneley. If the results of the tests appeared to favor the one or the other of these appliances, the inventors would find it difficult to prove that those ap-

parent advantages were due to the particular construction of their devices. We may deal with these and other tests after the work has been concluded.

Our colleagues in Germany do not by any means underrate the importance of the smoke combustion problem. The tests of steam engines conducted in connection with the Frankfort Electrical Exhibition dealt with this question. They have also been commented on by Mr. Stribeck. In 1890, the Verein Deutscher Ingenieure offered a prize of $1,000 for the best historico-critical treatise on the smoke nuisance. Authors were invited to review appliances constructed and tests made in different countries. At the end of the two years specified, six papers had been received; none was adjudged worthy of the prize. The judges did not condemn the authors, but declared that they were fully aware of the great difficulties which the task involved; they raised the premium to $1,500, and offered compensation for expenses incurred in actual experiments. Particulars respecting this competition can be found in the *Zeitschrift des Vereins Deutscher Ingenieure*, 1893, page 1,151. About that time several associations of architects and of engineers in Germany clamored for legislation on smoke prevention. Their views, explained in a pamphlet of 18 pages, did not commend themselves to the Council of the Verein Deutscher Ingenieure, whose declaration, signed by the Director of this body, Mr. Th. Peters, and by the referee on the smoke problem, Mr. C. Bach, emphasized the contention that the time for further legislative interference had not come yet.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. Alexander C. Humphreys, of the firm of Humphreys & Glasgow, arrived home per steamship Normannia on the 19th inst. He is the picture of health, and reports that the gas industry of Europe is in a rugged state. His firm have constructed several good examples of their type of water gas apparatus in England, and he is quite sanguine of still more pronounced success in that direction.

Mr. John S. Kennedy, who at one time was prominent in the affairs of the Pittsburgh (Pa.) Gas Company, is dead. He was in his 76th year and had been a resident of Pittsburgh from the time of his birth.

At the annual meeting of the St. Joseph (Mo.) Gas and Manufacturing Company, the Directors chosen were: Messrs. J. W. Turner, K. M. Mitchell and S. C. Woodson. The Directors subsequently elected Mr. J. W. Turner to the Presidency.

Superintendent Adams, of the Richmond (Va.) City Gas Works, reports that the make of gas for March, 1895, was 19,802,000 cubic feet, against a make of 18,572,000 cubic feet for March, 1894, a gain of 1,230,000 cubic feet.

At the instance of the President (Mr. L. H. Huntley) of the Somerville (Mass.) Common Council, the following resolution was recently adopted: "Ordered, That some action be taken by the city government to secure for the citizens of Somerville a reduction in the price of gas from $1.40 per 1,000 cubic feet to $1 per 1,000, the same as furnished to the greater part of Boston and is requested by Charlestown, East Boston, Roxbury and other places; and that his honor, the Mayor, be requested to confer with the gas companies and to take such steps as in his judgment may seem best to secure this change."

The following is the report (it was after some discussion adopted by the Council) of the special committee of the Lafayette (Ind.) City Council, appointed to consider the matter of the advisability of granting a franchise to the promoters of the Citizens Gas, Electric Light and Power Company of Lafayette: "The Committee * * * reports: That the Company is not incorporated, having never filed its articles of incorporation with the Secretary of State and received a certificate authorizing it to do business, and therefore has no legal existence and could not accept an ordinance if one should be granted it. The Committee further reports that it has made an examination of the showing made by said Company, and the amount and character of the stock subscribed. The Committee finds that a considerable portion of the stock subscribed to said Company is not *bona fide*. It further finds that a considerable portion of said stock is subscribed, in the opinion of the Committee, by persons not financially responsible for the amount of stock by them subscribed. It further reports that, so far as it has been able to ascertain, it has found no one who has subscribed for stock that expects to pay for the same. On the contrary, it is expressly stated by the promoters of said Company that the money to be furnished for the building of the plant is not to be furnished through the payment of the stock subscribed, but by bonding the rights and franchises of the Company with all of its stock unpaid, and using the proceeds of the bonds in the building of the plant. One who invests no money in a business venture like this, has nothing to lose, can have very little interest in the matter, and does not manifest much confidence in the matter. It is the opinion of your Committee that if the promoters of this Company, and the subscribers of the stock thereof, have not sufficient confidence to put in their own money to build the plant, or at least a goodly portion of it, this Council ought not to have sufficient confidence in the scheme to grant the Company a franchise. To grant a franchise is a serious matter, inasmuch as it will result in the tearing up of streets and alleys all over the city, and no difference how carefully the work is done, it will afterward necessitate the expenditure of many thousands of dollars in making repairs that would not have to be made if they were not thus torn up, and the decrease in the cost of light should be considerable to fully compensate the damages to the city, and the people of the city. For these reasons we think it is the duty of this Council to be very careful about granting such franchises. Therefore, inasmuch as the Company has wholly failed to comply with the requirements of the Council, and, as this Committee thinks, shows a want of confidence in itself by attempting to bond the stock of the Company before paying for the same, or for any part of the same, and for the further reason, which is sufficient in itself, that it has no legal existence and could not accept a franchise, your Committee recommends that no ordinance be considered in this matter until the Company is legally organized, and until it has fully complied with the previous requirements of this Council."

Mr. Robert G. Tobey, of Boston, has been named by the Governor of Massachusetts to the office of Clerk of the Board of Gas and Electric Light Commissioners.

Mr. A. B. Slater, Jr., Secretary of the American Gas Light Association, delivered a practical and entertaining address, on "Lights," before the Young Men's Christian Association, of Pawtucket, R. I., on the evening of the 17th inst. The address was given under the auspices of the Library Committee of the Association.

The authorities of Toledo, Ohio, have about abandoned the scheme to construct and operate a gas plant on municipal account.

At the annual meeting of the Chuctanunda Gas Light Company, of Amsterdam, N. Y., the Directors chosen were: Stephen Sanford, John Kellogg, Davis W. Shuler, David D. Cassidy, David Cady, John K. Stewart and James A. Miller. The annual reports showed an output for the year of 17,046,700 cubic feet, an increase of something over a million cubic feet for the twelvemonth. During the year the main system was much improved, the notable feature of the betterment being the placing of the new main in that portion of Bridge street which runs through the Fifth Ward. The Church street main was replaced by one of a larger diameter. The proprietors are well satisfied with the outlook.

Mr. J. H. Winchel has purchased a controlling interest in the Le Mars (Ia.) Gas Light Company.

At the annual meeting of the Bridgeport (Conn.) Gas Company the Directors elected were: Messrs. W. R. Higby, S. C. Trubee, H. L. Clark, W. B. Hincks, W. D. Bishop, W. H. Perry, A. J. Hobbs, E. G. Burnham and M. B. Beardsley. Subsequently the Directors perfected organization as follows: President, W. R. Higby; Secretary and Treasurer, F. B. Sammis; Superintendent, C. A. Gerdenier. The action of the Directors in reducing the price of gas (the new rates were given in our issue of the 15th inst.) was ratified by the stockholders.

Mr. John Corscot, Secretary and Treasurer of the Madison (Wis.) Gas Company, has been elected Mayor of that city. And a right good chief executive he will surely be.

The Berlin Iron Bridge Company, of East Berlin, Conn., is building an extension to the casting shop of the Waterbury (Conn.) Brass Company.

The proprietors of the Kalamazoo (Mich.) Gas Light Company have determined to put in about two miles of 10 and 8-inch pipe, the same to act as feeders for the general system. The water gas plant is virtually

completed, but it will not be fired up until the improvements on the main system are completed.

Some weeks ago Mr. Albert A. Wray, who represents in this Legislature the 15th Assembly District of Kings county, introduced a bill which had for its object the prevention of a consolidation of the gas companies of Brooklyn. From "one cause or another" this measure was never vigorously pushed, and, in fact, it was merely nursed along until its real purposes were served. One of these purposes was that it should stand on the calendar so that another measure could be substituted for it at a date subsequent to the time limit under the rules governing the presentation of new bills to the Legislature, and this has come to pass. On the 19th inst., the Assembly Committee on Cities reported favorably the Wray substitute bill, the terms of which are appended. Judging from its title the act will apply to the Companies supplying gas in the cities of New York, Brooklyn and Buffalo:

"An Act regulating and defining the powers of corporations engaged in supplying gas, electricity for light, heat and power purposes in cities of the first class, and authorizing such cities to make contracts therefor, so as to secure reductions in the prices thereof.

"Section 1. The municipal officers authorized by law to contract in behalf of any city of the first class for the lighting of its streets, may, from time to time, in the manner, upon the terms and with the conditions hereinafter provided, contract in behalf of such city with any corporation or corporations then supplying gas therein, for a supply of gas to such city, for and during such specified period not exceeding 15 years, as shall by such municipal officers be deemed to be for the best interests of such city and inhabitants thereof.

"Sec. 2. Every such contract shall be let at public letting as required by law, and as a consideration for the execution and performance thereof shall expressly provide for and secure to such city prices lower than any now prescribed therein by law, and a progressive reduction in such price for each year during the continued performance of such contract, and also adequate assurance of the continued mutual performance of such contract according to the conditions thereof, with proper indemnity to either party to such contract against any possible violation, impairment, abrogation or suppression thereof within the term specified. Every such contract shall also provide and require that during the term specified, the corporation party thereto may and shall supply gas or electricity (as the case may be) to the inhabitants of such city at prices lower than those now or then charged therein by such corporation party thereto, and progressively lower for each year of such term; any company or corporation bidding for such contract shall specify such several prices and reduction, and price for the several classes and terms of gas and electricity, and the same shall be considered in the award of any such contract to the bidders or bidder therefor, and the corporation receiving any such contract shall be entitled to charge and collect the prices therein specified during the continuance thereof.

"Nothing in this Act contained is intended or shall be construed to affect or impair any existing right or contract, except with the consent of the parties to any such contract.

"Sec. 3. All Acts and parts of Acts inconsistent with this Act are hereby repealed.

"Sec. 4. This Act shall take effect immediately."

The C. W. Hunt Company's machinery for handling and transferring materials of all kinds deservedly finds continued favor. Among recent contracts awarded it for a system of overhead trolleys for handling materials, we note that by the Ahrens & Ott Manufacturing Company, of Louisville, Ky.

It is said that the Council of Indianapolis, Ind., will attempt to enact an ordinance making it obligatory upon the local Gas Company to extend its mains when ordered to do so by the Board of Public Works.

The proprietors of the Clyde (N. Y.) gas works have applied to the Board of Trustees for the right to operate an electric lighting annex.

The following report respecting probable gas rates at Des Moines, Iowa, explains itself:

"To Messrs. L. H. Bush, C. L. Watrous, I. E. Tone, J. E. Clarey and C. D. Boardman, members of the Citizens Committee to investigate and report to the City Council, of Des Moines, and to the citizens of said city, a reasonable rate for the manufacture and sale of gas to the city and citizens thereof:

"Gentlemen—The undersigned, to whom was referred the question of the rights of the city of Des Moines, through the Council, to order and establish reasonable rates for the supplying to the city and its citizens of gas for fuel and illuminating purposes, respectfully reports as follows:

"They have investigated said question and are of the opinion that the city of Des Moines possesses the right delegated to it under the statutes of the State of Iowa, to ordain and establish reasonable rates for the supply of gas to said city and the inhabitants thereof.

"That in the determination of the question as to what constitutes reasonable rates, the city must establish a rate which would give a reasonable return upon a sufficient sum of money such as might be necessary to erect and operate a gas plant in said city at the present time, such gas plant to be constructed upon the most improved methods known to the trade, adopting appliances and means generally recognized by gas experts as being adapted to the purpose in view.

"They would recommend that in the passage of any ordinance regulating gas rates, an express reservation be incorporated in the ordinance to the effect that no new rights are granted to the Capital City Gas Light Company or any Gas Light Company, furnishing gas thereunder, in addition to those now possessed by said Company or Companies.—J. G. Day, J. K. Macomber, J. M. McCoughan, W. H. Bailey, J. G. Berryhill."

In our issue for April 15th we were obliged to report the death of Mr. Geo. M. Landers, the President of the New Britain (Conn.) Gas Light Company, and now we are regretfully called upon to note the decease of his associate in business, Mr. Augustus P. Collins, one of the original incorporators of the Company, and for years a member of its Board of Directors, as well as its Secretary and Treasurer. His death occurred on the morning of the 21st inst. We are indebted to a correspondent for the following sketch of his life, to which we might add that he was a member of the American Gas Light Association, having been elected to membership therein at the ninth annual meeting, held in Boston, October, 1881:

"Augustus P. Collins was born at Andover, Mass., March 21, 1822, and was the son of the Rev. A. B. Collins, a Congregational minister. His early education was received at Andover, and later at a private school. At the age of 15 he entered the employ of Governor Buckingham, in his Norwich drygoods store. After four years' stay in that position he started a general store on his own account in Willimantic, Conn. In 1864 he married Harriet, daughter of Judge Beckley, of Berlin, Conn. Being unsuccessful in his venture at Willimantic, he removed to New Britain, Conn., 1850, and engaged in the clothing business with Mr. Norris Bailey, and was also associated with Mr. C. A. Northend for 26 years in the insurance business. In 1857 he was elected Treasurer of the Savings Bank and Building Association. Three years later, when the former institution was merged in the New Britain National Bank, Mr. Collins was elected Cashier. On the death of Mr. C. B. Erwin (1885) he was raised to the position of President, which place is left vacant by his death. Mr. Collins was one of the original incorporators of the New Britain Gas Light Company, and served as its Secretary and Treasurer up to the time of his death. He was a Director in the Landers, Frary & Clark Company, the Malleable Iron Works, and the Union Manufacturing Company. In his public career Mr. Collins had assisted many individuals and public charities by his benefactions. He was always willing to go into new enterprises, and took a lively interest in the welfare of New Britain. He was elected Town Clerk in 1855, and after holding the position for several years was elected Town Treasurer, which place he held for 35 years. He was City Treasurer from the incorporation of the city, 1871, until 1889. Mr. Collins was a member of the South Church, and also a member of its official board. He has contributed freely towards the support of the church, having recently pledged himself for $1,000 for the new organ. Mr. Charles Collins, of Rahway, N. J., is the next of kin."

The Adrian (Mich.) *Press*, in commenting editorially upon the Welsbach lamp light (numbers of which lamps have been placed in that city), remarks: "An incandescent electric light is not to be compared with this new device, which saves gas and gives a brilliant, powerful, yet soft, clear, white light that one cannot help admiring."

The newly-elected Mayor of Adrian (Mr. Kirkpatrick), however, does not seem to be as up-to-date as is the *Press;* for in his inaugural message he thinks or believes that Adrian, if one may judge him by what he says, ought to be in complete darkness after midnight. At any rate, here is what he said: "The use of the electric lights after midnight should be discontinued. * * * The criticism that it would make

burglaries more frequent should not be sufficient to continue the expense, as lights are used for the accommodation of honest people, and were not designed especially to catch burglars by."

Correspondence

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

Mr. Bredel on Mr. Wood's Criticism of the Former's Estimate of the Cost of Producing Calcium Carbide.

MILWAUKEE, WIS., April 20, 1895.

To the Editor AMERICAN GAS LIGHT JOURNAL: On reading Mr. Wood's so-called correction, in the JOURNAL for April 8th, p. 492, it occurred to me that some of your readers may have determined from my article on carbide of calcium [1] that the material could be sold at $40 per ton. On the contrary, the statement shows that it could not theoretically be manufactured at less than the price named.

Mr. Wood's statement that "the estimates made of the cost of producing the calcium carbide, by the *only persons* who have thus far produced any quantity of it," is a mistake. Carbide of calcium has been produced in this country by different parties, and I have seen the material so manufactured. It has been produced on a large scale by one concern; and I wish to repeat herewith that my figure of $40 per ton is the minimum under which it could be produced.

As far as the actual cost of production is concerned it cannot be sold for less than 5 to 6 cents per pound, or from $100 to $120 per ton, when water power is used. This figuring is not the result of guesswork, but represents an actual working result based on the present state of the art of electric smelting, and on a large daily output. Furthermore, as far as $5 per horse power is concerned, the reference must be to undeveloped power, for certainly nobody could furnish an electric horse power, per year of 7,440 hours, for that money. Not charging anything for motive power, for repairs, nor for interest on capital invested, the cost of running a dynamo, including repairs on same, attendance, grease, brushes, etc., would amount to more than $5 per horse power per annum. Therefore, the figure in that instance is absolutely valueless. I regret that I made a mistake in multiplication. The figures should have been, as Mr. Wood remarks, 136.53 calories, instead of 135.53 calories, for every gram calcium carbide, but as this error stands for only 0.74 per cent., the mistake is virtually of no consequence in the final result, although it would increase the cost of manufacture about 6 cents per ton. Furthermore, Mr. Wood's cost for powdered lime is too low. Again, in his revised figures, he puts the consumption of carbons at $2.23, which is absolutely too low. The carbons cost at least one-tenth cent per horse power hour. Mr. Wood also adds 40 per cent. for manufacturer's profit; but I never made such a statement. The $11.50 (item 10) given in my estimate represents an allowance for fixed charges, which cannot be cut down under any conditions, no matter whether an electric horse power could be obtained for $1 per horse power per annum, or if lime and coal could be obtained for $1 per ton, since the allowance has nothing whatever to do with either the power generating plant or the cost of raw material. Therefore I think it is clearly shown that Mr. Wood's statement is based upon an imaginary cost of electric horse power and a ridiculously low price for fixed charges, and under the supposition that as uncertain a process as electric smelting would go off every time without a hitch.

Mr. Wood's statement that 2,000 lbs. carbide of calcium, of the chemical composition of CaC_2, could be obtained with an electric energy of 100-horse power per 24 hours, or 2,400-horse power hours, is absolutely wrong. My statement clearly shows that, theoretically, 2133.3 cal. per kg. are required in the reduction process, or 1,938,958 kgs. cal. are required per 2,000 lbs. English, or, at 637 cal., would be 3,044-horse power, providing the horse power could be transformed into heat without any loss whatever, either by transformation or radiation. In fact, in this view of the case, somebody must have discovered a process by which something can be made out of nothing.

I am well aware that a ton of similar appearing material could possibly be produced with the horse power named by Mr. Wood; but the material would be only partly reduced. It would be a mixture of CaO and CaC_2 and C—*i. e.*, part of the calcium oxide would not be reduced.

I have seen a material manufactured which would only give off from 1 to 1.5 cubic feet of acetylene gas per pound of carbide. Almost anyone could be easily deceived in respect to this, for both materials resembled each other very much, judging by the eye.

Another way by which to prove the fallacy of Mr. Wood's 2,400-horse power per ton statement is to consider the amount of heat obtained from acetylene, which certainly cannot be more than the heat in the coal used in the reduction process plus heat obtained from the electric horse power, minus specific heat carried away by the molten carbide, which latter heat is irredeemably lost. In other words, heat contained in the 2 C of CaC_2, plus heat developed by 1 C burned to CO, to burn out the O in CaO, plus electric horse power, should at least be equal to heat contained in C_2H_2, plus heat carried away by the molten carbide, and we have, therefore, as follows—all expressed in gram. cal. per gram. molecule:

C_2H_2, burnt to CO_2 and H_2O develop		= 317,500 cal.
+ 3,000 × 19.08		= 57,250 "
Total		374,740 cal.
less		
2 C, burnt to CO_2, develop	186,296 cal.	
+ 1 C, burnt to CO, develop	68,200 "	
		254,496 cal.
Total		120,244 cal.

This amount of heat must be produced by the electric current, which, expressed in horse power at 637 cal. = 0.188766 horse power. This is for 64 gram CaC_2 = 2.949468 horse power per kg., or 1.340277 horse power per pound English, or 2,680-horse power per ton. Now, if anybody can accomplish this with 2,400-horse power, he must have some kind of a secret system not known of ordinary men—possibly interatomic ether.

A reduction process cannot be attempted at the above figures, since no allowance is made for loss in the furnace or loss by radiation, nor power employed for splitting up CaO. Yours truly, FRED. BREDEL.

[Since writing the above, I read the following notice in the *Journal fuer Gasbeleuchtung:* "*Calcium-carbid.*—The Aluminum Industrie Actien Gesellschaft in Neuhaussen (near Schaffhausen), Switzerland, is going to manufacture carbide of calcium, and can already sell same to parties at about 50 pfennigs (equal 12 cents United States currency) per kg." This is the first time that calcium carbide has come in the market at a reasonable figure; and it amounts to about $110 per 2,000 lbs. The water power at Schauffhausen is certainly as cheap as any water power in the United States, and labor and material can certainly be obtained there as cheap, if not cheaper, than at any named point in this country.—BREDEL.]

1. See JOURNAL, Feb. 24, 1895, p. 260.

Calcium Carbide Prices in New York.

NEW YORK, April 20th, 1895.

To the Editor AMERICAN GAS LIGHT JOURNAL:

Dear Sir—Some time since I received a request from a foreign correspondent to secure the lowest prices for calcium carbide, in 1, 5, 10 and 20-ton lots, f.o.b. at Antwerp.

After correspondence, in which I urged the lowest prices, as I wished to build up a large trade, and assured them terms were C. O. D., I received to-day the following letter:

EIMER & AMEND, MANUFACTURERS AND IMPORTERS OF CHEMICALS AND CHEMICAL APPARATUS,
205–211 Third Av., Cor. 18th St., New York, April 19, 1895.

Mr. S. M. Hugh, New York, N. Y.:

Dear Sir—In reply to your letter, in which you say that the calcium carbide is to be used for chemical purposes, and not for heat, light or power, we are pleased to quote:

1-ton lots, at 12 cents per pound; 5-ton lots, at 10 cents per pound; 10-ton lots, at 9 cents per pound; 20-ton lots, at 8 cents per pound. Freight paid to New York, and $10 extra for water tight drums, holding about 1,200 pounds each, and shall be pleased to receive your order for the same. The delivery would be subjected to the limitation of output, as the great many calls for this material may cause delay in furnishing. It would be well, therefore, to place your order as soon as possible, to get ahead of others. Yours respectfully,

EIMER & AMEND, per E.

You will notice the circus man's trick, "Come early, ladies and gentlemen, and avoid the rush at the doors." As to the limitation of production, it may be well to recall the statement made by Professor Laudy, in his lecture before the American Institute, on Thursday evening, April 18th, in which he said that he had cornered the market on an order for 25 pounds, being able to get only 10 pounds.

That it will not be long before the new craze follows the old ones to the limbo of oblivion, but ere that time "Men must bleed, and women must weep" for the dividends that never came, is the honest belief of

Yours truly, S. M. HUGH, New York City.

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AGENTS:
New York—American News Co., 39 and 41 Chambers St.
Germany—B. Westermann & Co., of New York.

MONDAY, APRIL 29, 1895.

Atmospheric Electricity.

An interesting lecture upon "Atmospheric Electricity" was delivered some weeks ago, by Professor Schuster, before the Royal Institution of Great Britain. An abstract is appended:

When this science was but in its infancy, it was noticed how the spark of a battery resembled thunder and lightning, and the idea soon became generally, although somewhat vaguely, accepted that a flash of lightning was only a form of electrical spark, while it was left to Franklin, who had long suspected that a thunder cloud was charged with electricity, to establish by experiment a complete parallelism between lightning and electricity. This he successfully accomplished in the year 1752, and on his researches are based the complete understanding we now have as to the various phenomena of atmospheric electricity. After briefly alluding to Franklin's and Faraday's work in connection with the subject, the question of the origin of the "lines of force" was discussed, and Professor Schuster passed on to consider the various causes of de-electrification which are constantly going on. Important factors are fires; these discharge electricity constantly, and it was pointed out incidentally that factory chimneys themselves act as good conductors of electricity, better even than the lightning rod which is fixed to the summit. Having pointed out that the theory sometimes put forward as to the disappearance of the "lines of force" by passing away from the air into space was untenable, the Professor showed that on rising in the air the "lines of force" at first increase, but at altitudes of 15,000 to 20,000 feet they end. Their disappearance, however, depends upon the condition of the atmosphere, as in very fine weather they end at 12,000 feet. The fact that electrical effect in the atmosphere is dependent upon the moisture present is well established, but some observers have had an idea that it is influenced by solar radiation instead, and an instance was cited which showed that electrical effect in Germany was directly connected with a dust storm which occurred in Alexandria, the electrification not being shown before the storm.

In discussing the effect of lightning upon trees, statistics showed that 48 oak trees are struck to one beech tree, the ratio being dependent upon the amount of oily matter contained. Some curious effects of lightning having been described, a series of photographs were shown illustrative of various types of flashes, and after briefly alluding to silent discharges, the Professor described the phenomenon known as St. Elmo's fire. This name is derived from St. Erasmus, who was the patron saint of the Italian sailors. Its peculiarity is that it appears as either positive or negative, one condition being as probable as the other. The phenomenon is simply one of induction. The various hypotheses which have been advanced to account for atmospheric electricity were briefly noted. Their name seems to be legion, as they number since 1753 more than a score, while the year 1884 alone produced five new theories. Of this number the rotation of the earth, direct radiation, heat, and evaporation may be mentioned, and an instance was given where, from personal observation, electrical effect was shown to be due to the actual formation of cloud.

Speaking of the aurora borealis, it was mentioned that it seems to be connected with cirrus clouds at low altitudes, and that the many spots in the sun have been sometimes attributed to the existence of many auroras. The lecture was profusely illustrated by experiments, all of which passed off without a hitch.

Berlin Industrial Exhibition, 1896.

According to a report recently made by the American Consul-General at Berlin, that city is to hold an exhibition during the spring and summer of 1896, in honor of the city's advance as an industrial and manufacturing center. When first mooted, this exhibition was to have had a very broad international character, but other exhibitions—notably the projected World's Fair at Paris for 1900—caused the abandonment of that intention. It is to be mainly an exhibition of the products of Berlin workshops, industries, and fine arts, but will not exclude articles made in Germany, if they are sold in Berlin, or have some other local relationship. The presence in Berlin of an agency or shop for the sale of such articles entitles the German who is not in Berlin to exhibit. Notwithstanding these limitations, there is said to be a way for foreign exhibitors to participate, namely, on the same grounds as Germans not of Berlin, by showing that they have an agency or representative in the city. The exhibition is to be held at Treptow Park, on the upper reaches of the Spree, in the eastern part of the city. The municipality has already granted extensive privileges to several electric surface car lines and one elevated line, in order to place the center and west of the city in easy communication with the grounds. These contain some fine sites on the banks of the Spree in a rather flat country, some distance from the more closely-built part of the town. Great preparations have been made in the way of new bridges over canals and branches of the Spree.

The Market for Gas Securities.

Consolidated is gradually increasing in value, sales having been made in it to-day (Friday) at 138. We have no doubt that this upward movement will be progressive and permanent. The Company can easily pay 10 per cent. on its capital, and an increase in the dividend rate to that amount is by no means out of the possibilities for the near future. The Wray bill, the text of which will be found in our item columns, seems to contain stipulations that would rather work to the benefit than to the injury of the companies. Mutual is strong, at 158 bid, and so is Equitable, which is offered at 187. Brooklyn shares show no change. Chicago is up to 73, and a marked feeling prevails that it will go higher. Bay State is 17 to 18, and some say it will increase in value. Perhaps so; but the money of the investing public will not be the means of boosting it.

Baltimore is strong, at 63¾ to 64¼. Consumers, of Jersey City, has declared a dividend of 3 per cent., payable May 1st. The notices read that this is a semi-annual, which means the putting of the shares on a 6 per cent. basis; 72 is bid for it. The U. G. I. Company's annual meeting will be held in Philadelphia on May 6th; and the Standard Company, of this city, will hold its annual meeting May 8th. Laclede common is bid for at 28, and we rather think this specialty is a purchase, which judgment also applies to the shares of the Western Company, of Milwaukee, for which 51 is bid.

Gas Stocks.

Quotations by Close & Nash, Brokers and Dealers in Gas Stocks.
35 WALL ST., NEW YORK CITY.
APRIL 29.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$35,430,000	100	137	138
Central	500,000	50	140	..
" Scrip	220,000	..	100	..
Equitable	4,000,000	100	183	187
Bonds, 6's	1,000,000	1,000	105	107½
" 1st Con. 5's	2,300,000	1,000	112¾	..
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	158	..
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	..	..	.
Northern	150,000	50	..	..
" Bonds	150,000	..	..	98
New York and East River	5,000,000	100	26¾	28
Preferred	2,000,000	100	44	46
Bonds	3,500,000	1,000	84	87
Richmond Co., S. I.	348,650	50	50	..
" Bonds	100,000	..	..	..
Standard	5,000,000	100	46	47¾
Preferred	5,000,000	100	90¾	91½
Bonds, 1st Mortgage, 5's	1,500,000	..	104	..
Yonkers	.....	50	112	.
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	125	..
Citizens	1,200,000	20	65	..
" S. F. Bonds	320,000	1,000	..	101
Equity	2,000,000	10	..	..
" Bonds	1,000,000	..	..	..
Fulton-Municipal	3,000,000	100	175	..
" Bonds	300,000	..	108	..
Peoples	1,000,000	10	90	.
" Bonds, 7's	368,000	..	100	..
" " 6's	94,000	..	98	100
Metropolitan	870,000	100	170	..
" Bonds, 5's	70,000	..	..	..
Nassau	1,000,000	25	200	..
" Ctfs	700,000	1,000	99	100
Williamsburgh	1,000,000	50	200	..
" Bonds	1,000,000	..	107	110

Out-of-Town Companies.				
Bay State	5,000,000	15	17	18¼
" Income Bonds	2,000,000	1,000	19½	20
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	73	75
2d " " "	3,000,000	1,000	48	50
Buffalo Mutual	750,000	100	120	..
" Bonds	200,000	1,000	95	100
Chicago Gas Co.	25,000,000	100	73	..
Chicago Gas Lt. & Coke Co.				
Guaranteed Gold Bonds	7,650,000	1,000	93	93½
Columbus	1,089,000	..	..	..
1st Mortgage	1,085,000	..	..	..
Consumers, Jersey City	2,000,000	100	72	76
" Bonds	600,000	1,000	98	100
Cincinnati G. & C. Co.	7,000,000	100	..	203¾
Consumers, Toronto	1,600,000	50	184½	187
Central, San Francisco	.....	..	90	100
Capital, Sacramento	.....	..	..	50
Consolidated, Baltimore	11,000,000	100	63¾	64¼
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,400,000	..	..	..
Detroit	4,000,000	..	18	..
" Con. Bonds	4,312,000	..	..	..
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	74½	76½
" Bonds	2,000,000	..	83	85
Hartford	750,000	25	120	128
Indianapolis	2,000,000	..	..	144
" Bonds, 6's	2,650,000	..	103	..
Jersey City	750,000	20	195	..
Lafayette Gas Co., Ind	1,000,000	100	86	88
Bonds	1,000,000	1,000	89	91
Louisville	2,570,000	50	..	130
Laclede, St. Louis	7,500,000	100	28	28¾
Preferred	2,500,000	100	86	88
Bonds	9,084,400	1,000	94½	95
Little Falls, N. Y.	50,000	100	..	100
Bonds	25,000	..	..	100
Montreal, Canada	2,000,000	100	200	208
New Haven	.....	25	200	..
Oakland, Cal.	.....	..	43½	43
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	2,100,000	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	165	175
Paterson, N. J.	.....	25	99	102
Rochester Gas & Elec. Co.	2,150,000	50	..	..
Preferred	2,150,000	50	81	..
Consolidated 5's	2,000,000	..	87½	90
Syracuse, N. Y.	500,000	25	..	..
San Francisco, Cal.	10,000,000	100	73⅝	73¾
Washington, D. C.	2,000,000	20	250	..
Western, Milwaukee	4,000,000	100	51	53
Bonds, 5's	3,556,000	..	83½	—
Wilmington, Del.	500,000	50	188	190

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Davis & Farnum Mfg. Co., Waltham, Mass ... 632
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 632
Stacey Mfg. Co., Cincinnati, Ohio ... 635
R. D. Wood & Co., Philadelphia, Pa ... 634

Stockholders' Meeting.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
813 DREXEL BUILDING, PHILA., April 24, 1895.

The Annual Meeting of the Stockholders of the United Gas Improvement Company will be held at the Company's Office, Drexel Building, Philadelphia, Monday, May 6th, at 12 o'clock noon, when an election will be held for a President and six (6) Directors to serve for the ensuing year, and such other business transacted as may be brought before the meeting.

The stock transfer books will be closed from 3 P.M., Tuesday, April 30th, until 10 A.M., Tuesday, May 7th.

1088-1 EDWARD C. LEE, Secretary.

Situation Desired

By a Man of 20 Years' Experience

in the manufacture of both Coal and Water Gas. Also experienced in the erection of Water Gas Plants of the different processes. Address

1088-1 "C. J.," care this Journal.

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As Superintendent of Either Coal or Water Gas Works,

By a man of vast experience, who is at present Superintendent of a Gas, Electric Light and Water Works, but desires a change in locality. Can give first-class references.

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A Position as Supt. of a Large or Small Gas Works.

Is capable and energetic, and is willing to begin at a moderate salary. Address

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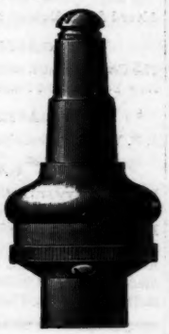

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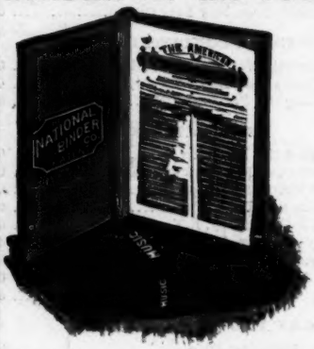

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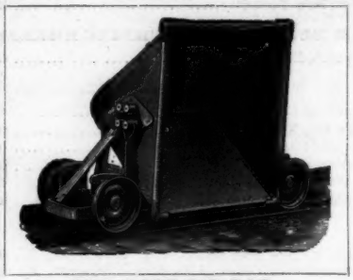

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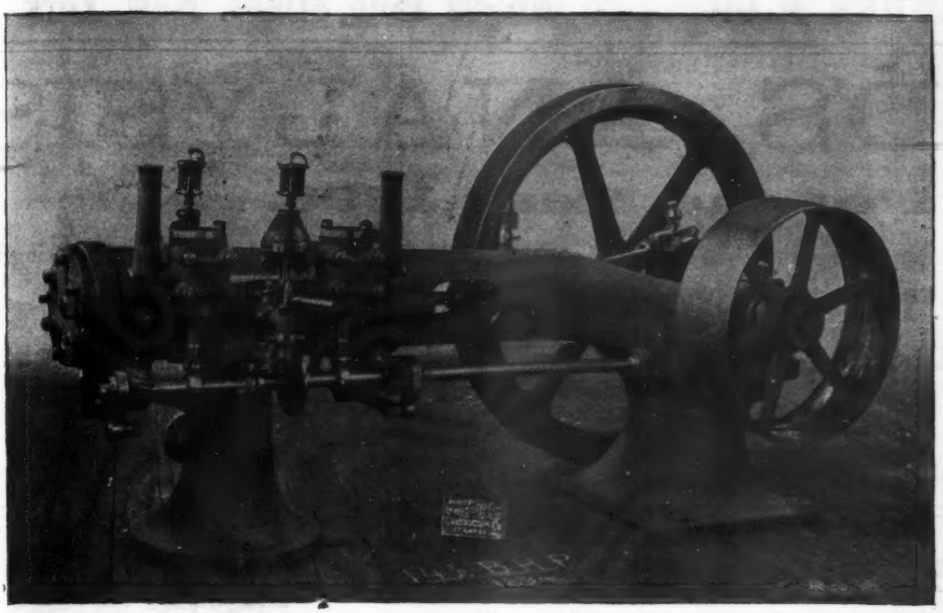
Under the Patents of Griffin, and Dick, Kerr & Co., of London and Kilmarnock.



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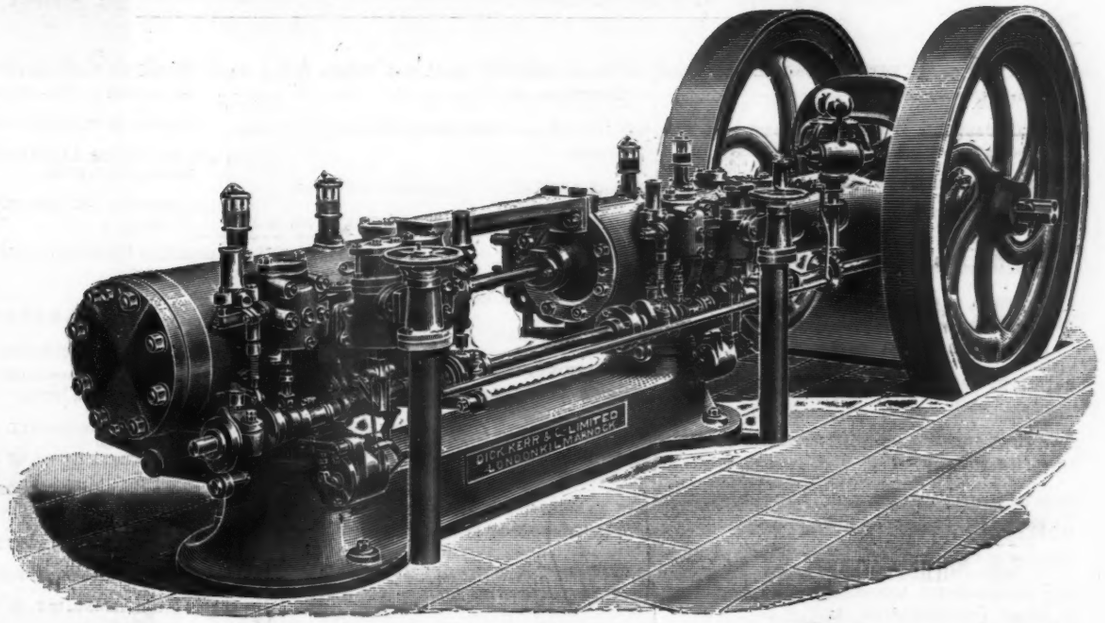

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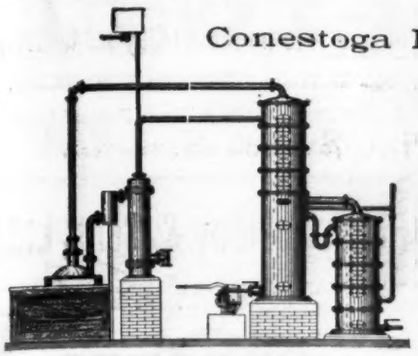

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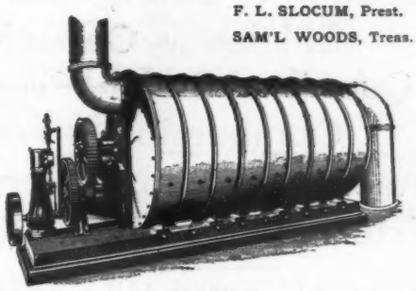

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Very truly yours,

R. J. ROLSTON, Superintendent.

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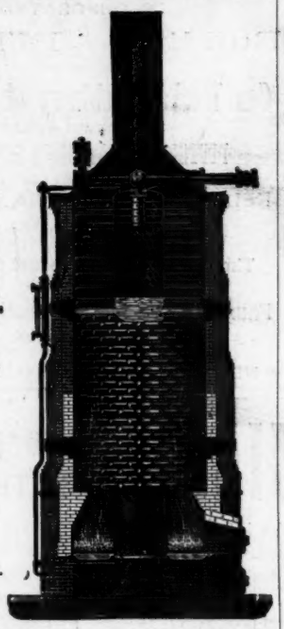

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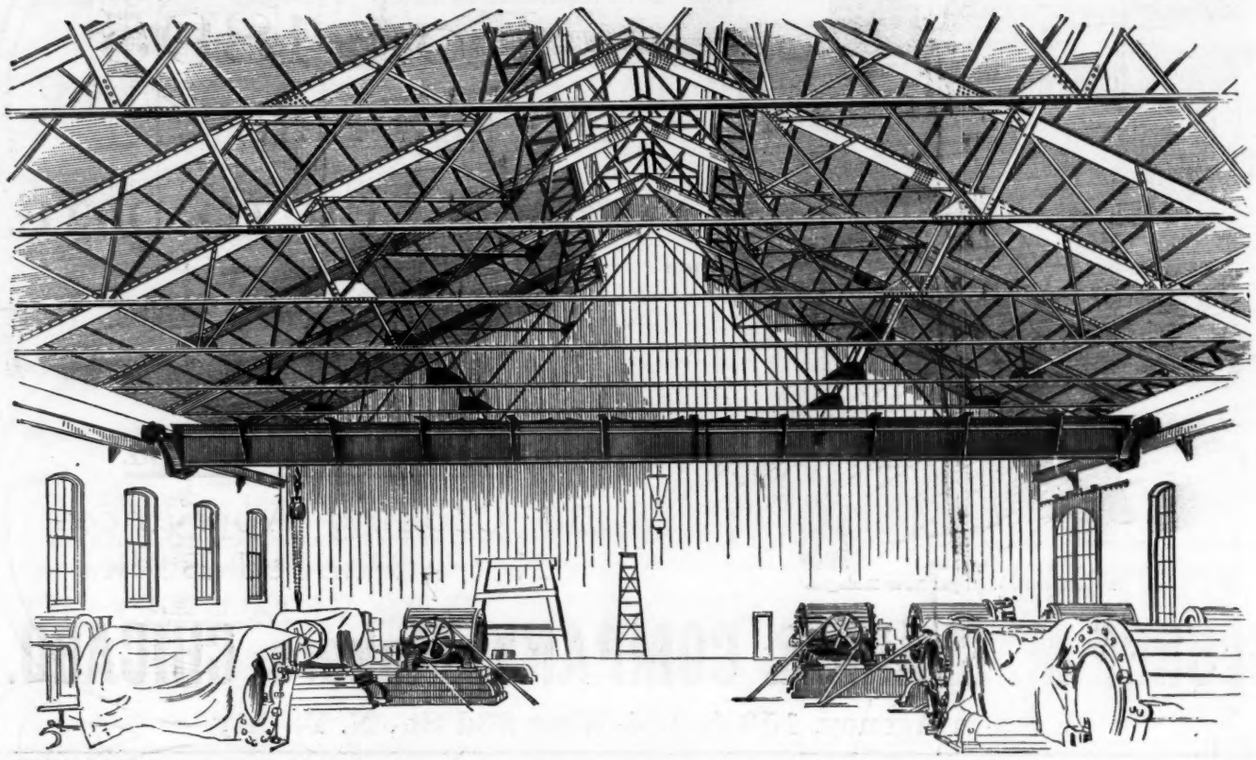

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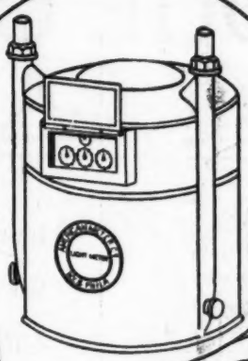

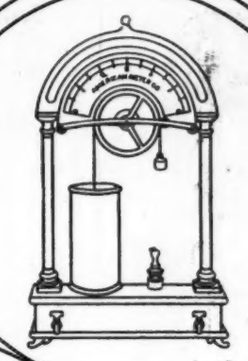

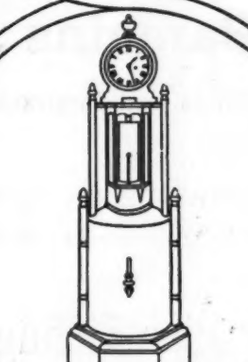

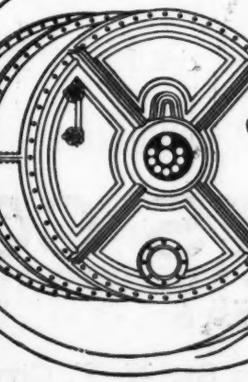

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SAN FRANCISCO.

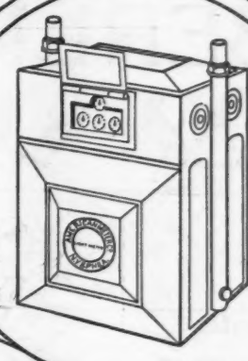
PUBLIC LIGHTING TABLE.

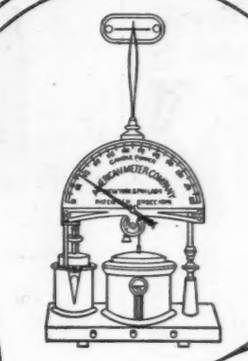
MAY, 1895.

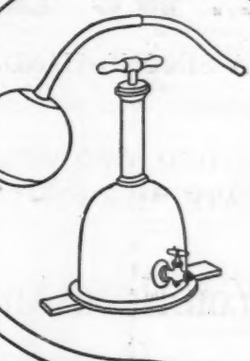
Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. Extinguish.
				P.M.	A.M.
Wed.	1	12.40 AM FQ	4.00 AM	6.45	4.00
Thu.	2	1.10	4.00	6.45	4.00
Fri.	3	1.30	4.00	6.45	4.00
Sat.	4	2.00	4.00	6.45	4.00
Sun.	5	2.20	3.50	6.45	4.00
Mon.	6	2.50	3.50	6.45	4.00
Tue.	7	No L.	No L.	6.55	3.40
Wed.	8	No L. FM	No L.	6.55	3.40
Thu.	9	No L.	No L.	6.55	3.40
Fri.	10	7.30 PM	10.30 PM	6.55	3.40
Sat.	11	7.30	11.30	6.55	3.40
Sun.	12	7.40	12.20 AM	6.55	3.40
Mon.	13	7.40	1.00	6.55	3.40
Tue.	14	7.40	1.30	7.00	3.30
Wed.	15	7.40	2.00	7.00	3.30
Thu.	16	7.40 LQ	2.20	7.00	3.30
Fri.	17	7.40	2.40	7.00	3.30
Sat.	18	7.40	3.00	7.00	3.30
Sun.	19	7.40	3.20	7.00	3.30
Mon.	20	7.40	3.40	7.00	3.30
Tue.	21	7.40	3.40	7.10	3.15
Wed	22	7.40	3.40	7.10	3.15
Thu.	23	7.40	3.40	7.10	3.15
Fri.	24	7.40 NM	3.40	7.10	3.15
Sat.	25	7.40	3.40	7.10	3.15
Sun.	26	7.50	3.30	7.10	3.15
Mon.	27	7.50	3.30	7.10	3.15
Tue.	28	7.50	3.30	7.15	3.15
Wed.	29	11.10	3.30	7.15	3.15
Thu.	30	11.40 FQ	3.30	7.15	3.15
Fri	31	12.00	3.30	7.15	3.15

TOTAL HOURS LIGHTING DURING 1895.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	237.00	January	423.20
February	196.40	February	355.25
March	195.50	March	355.35
April	165.30	April	298.50
May	153.40	May	264.50
June	138.20	June	234.25
July	146 30	July	243.45
August	152.50	August	280.25
September	165.10	September	321.15
October	186.10	October	374.30
November	204.10	November	401.40
December	219.30	December	433.45
Total, yr.	2161.20	Total, yr.	3987.45







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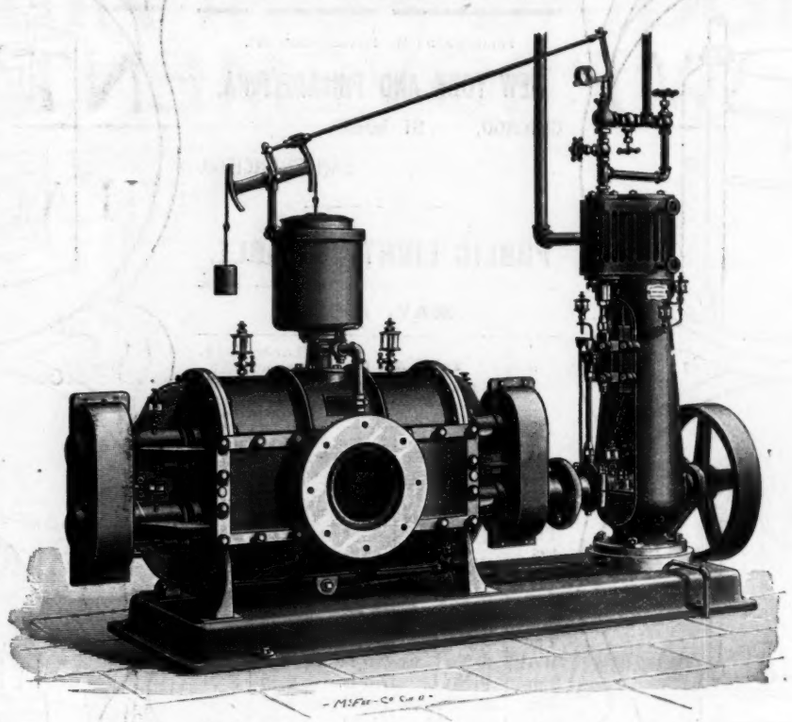

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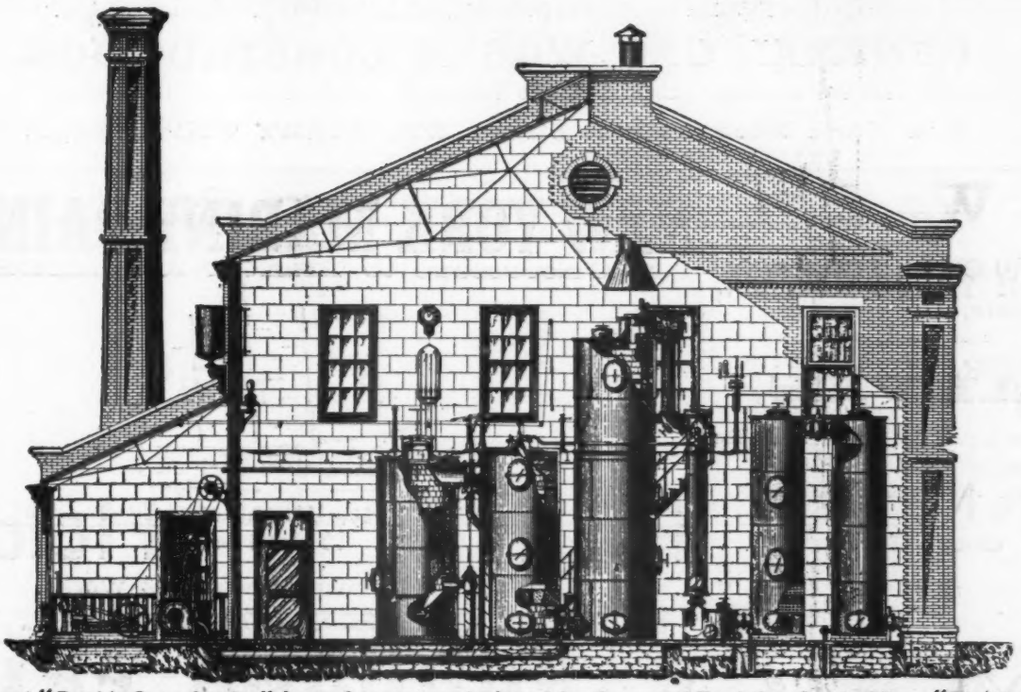

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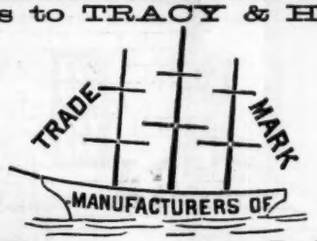

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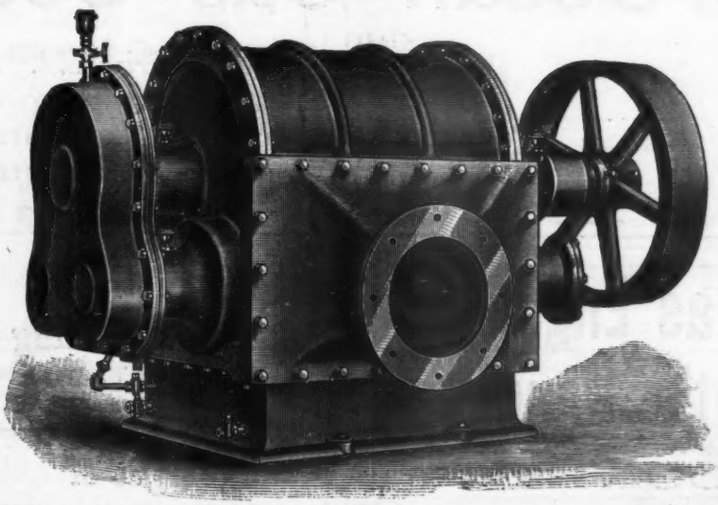

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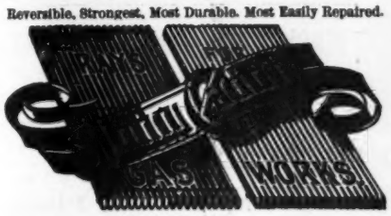

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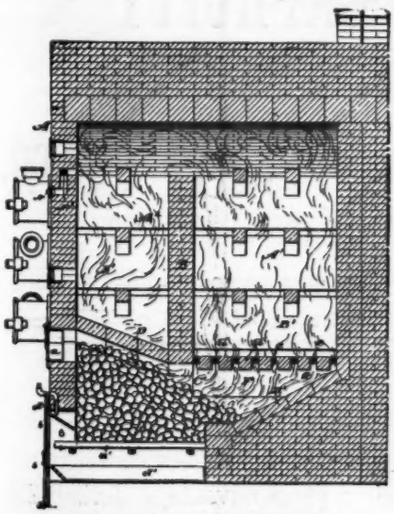

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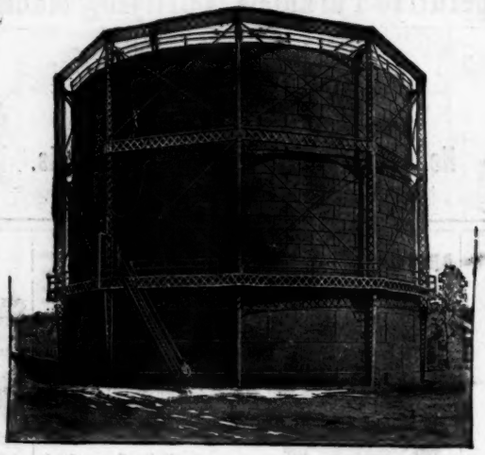

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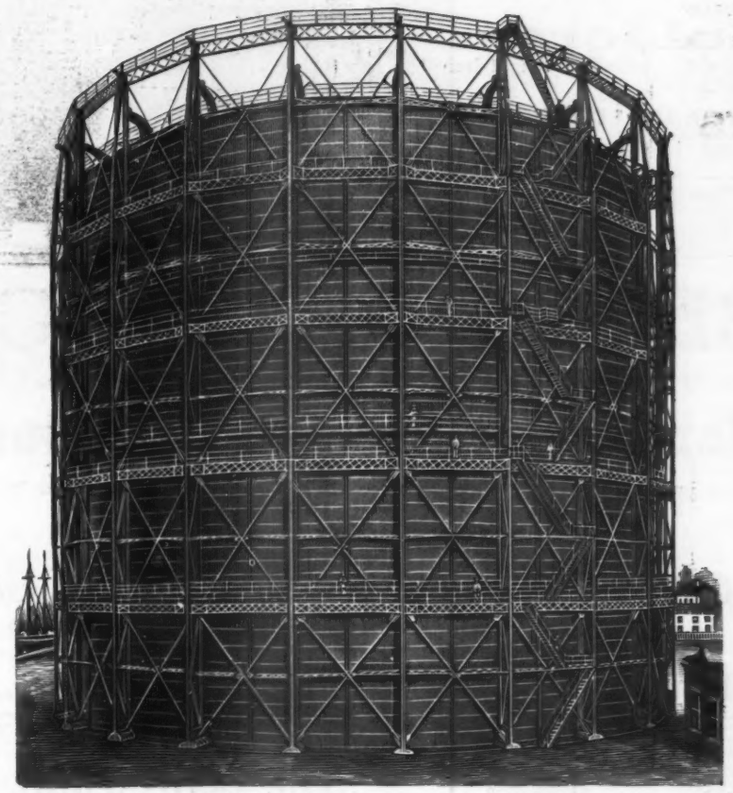

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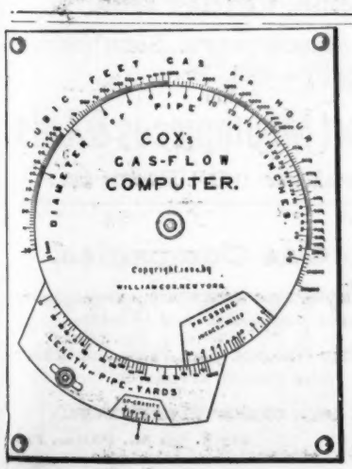

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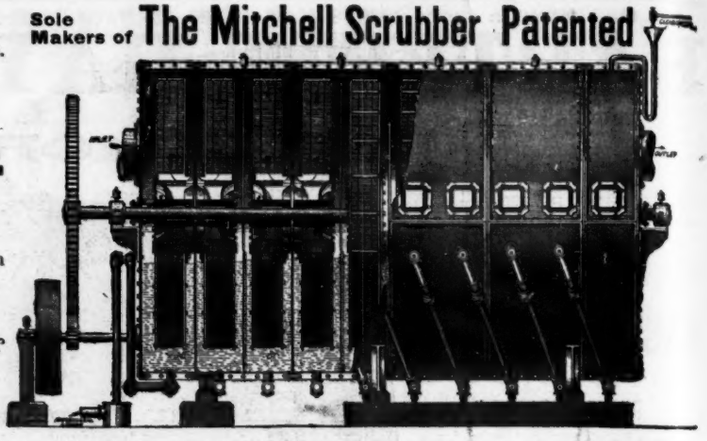

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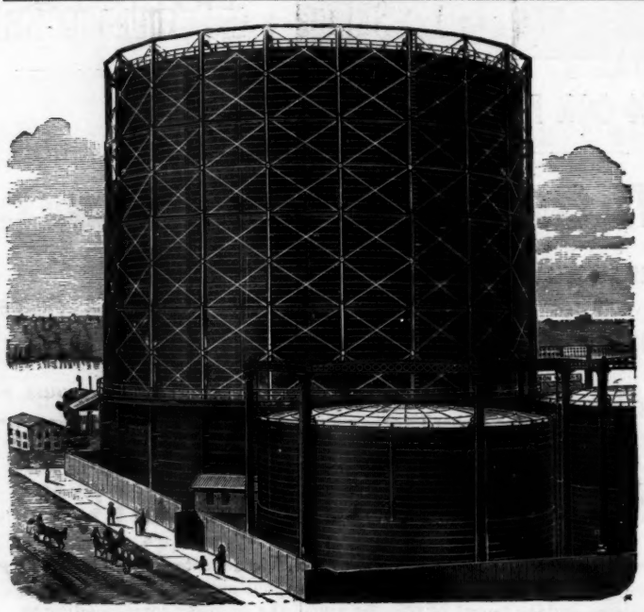

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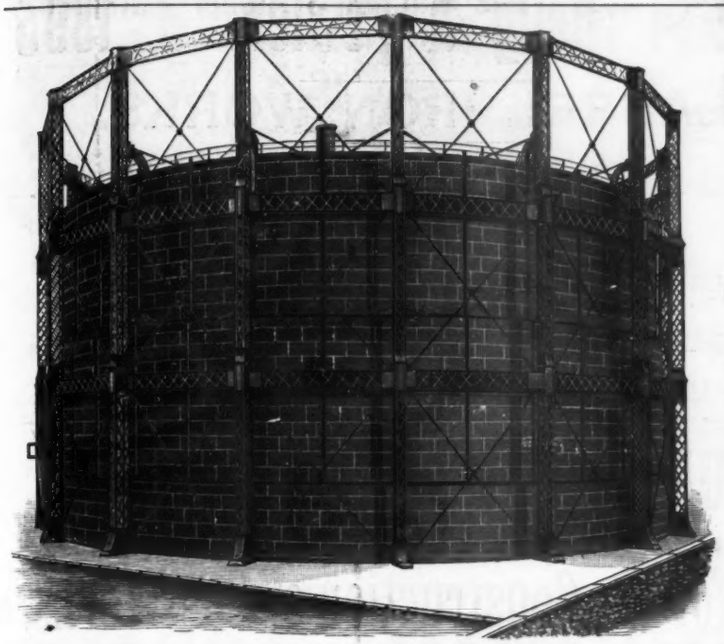

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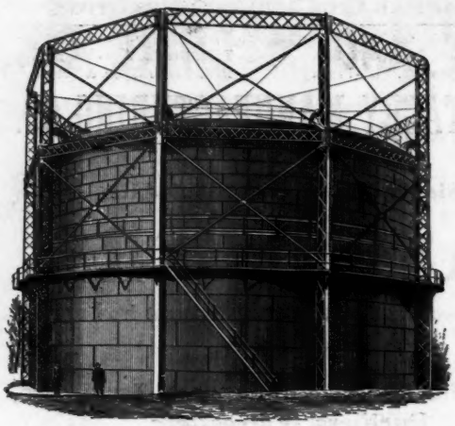

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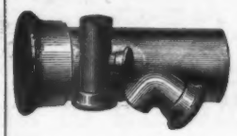

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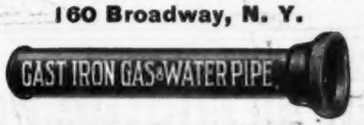

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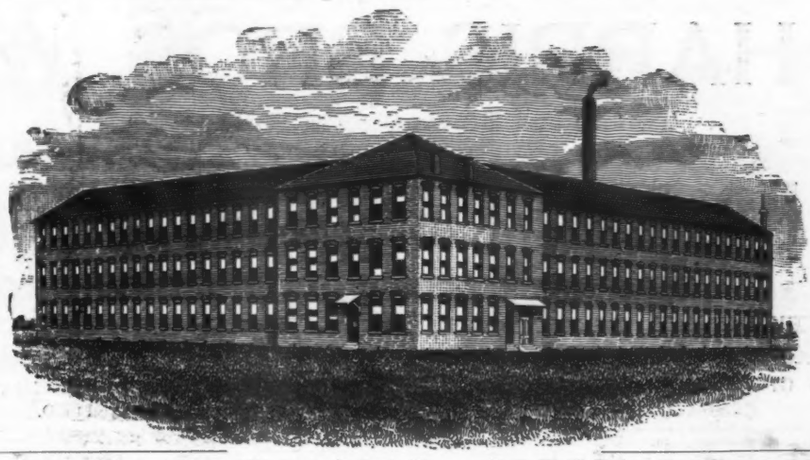

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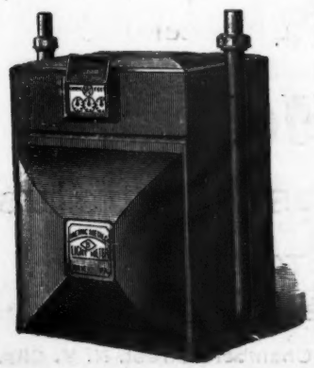

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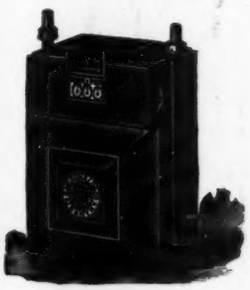

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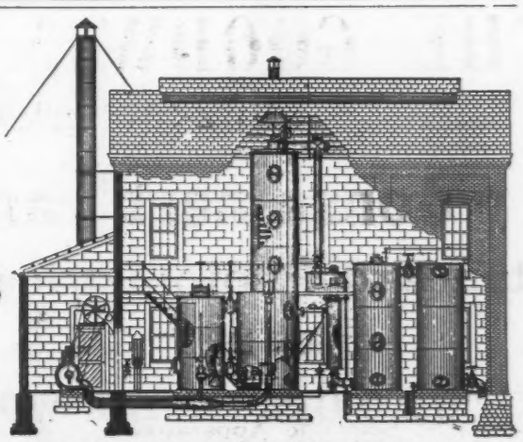

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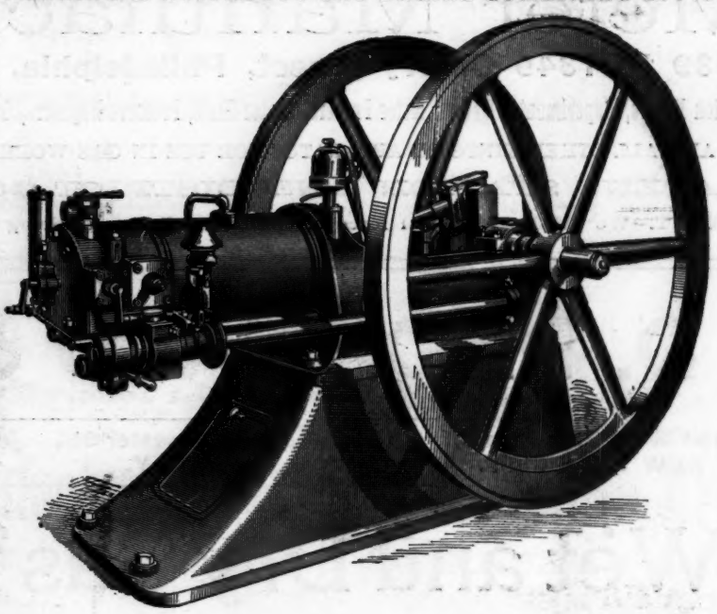

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